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CREAM-GRADING.

NOTEWORTHY EXPERIENCE OF THE NORTH AUCKLAND DAIRY FACTORIES.

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CREAM-GRADING as a means of maintaining the quality of the butter made under the home-separation system was not a general practice in North Auckland prior to 1st June, 1914, though one or two factories had paid for butterfat on a quality basis before that time. On that date a meeting was held at Auckland at which the organization since known as the North Auckland Dairy Conference was formed, the primary object of which was to formulate a system of payment for butterfat according to the quality of the cream when delivered to the factory. The evidence of these factories which had been working on this system was so decidedly favourable that it was unanimously agreed that its general adoption was desirable. It was realized, however, that any movement in this direction would not be looked upon with favour by those suppliers whose cream was of poor quality. An agreement was therefore drawn up and subsequently signed by the whole of the co-operative factories and some of the proprietary factories in the district, under which they undertook not to accept cream from any supplier who, after 1st August in any season, had supplied any other factory, unless

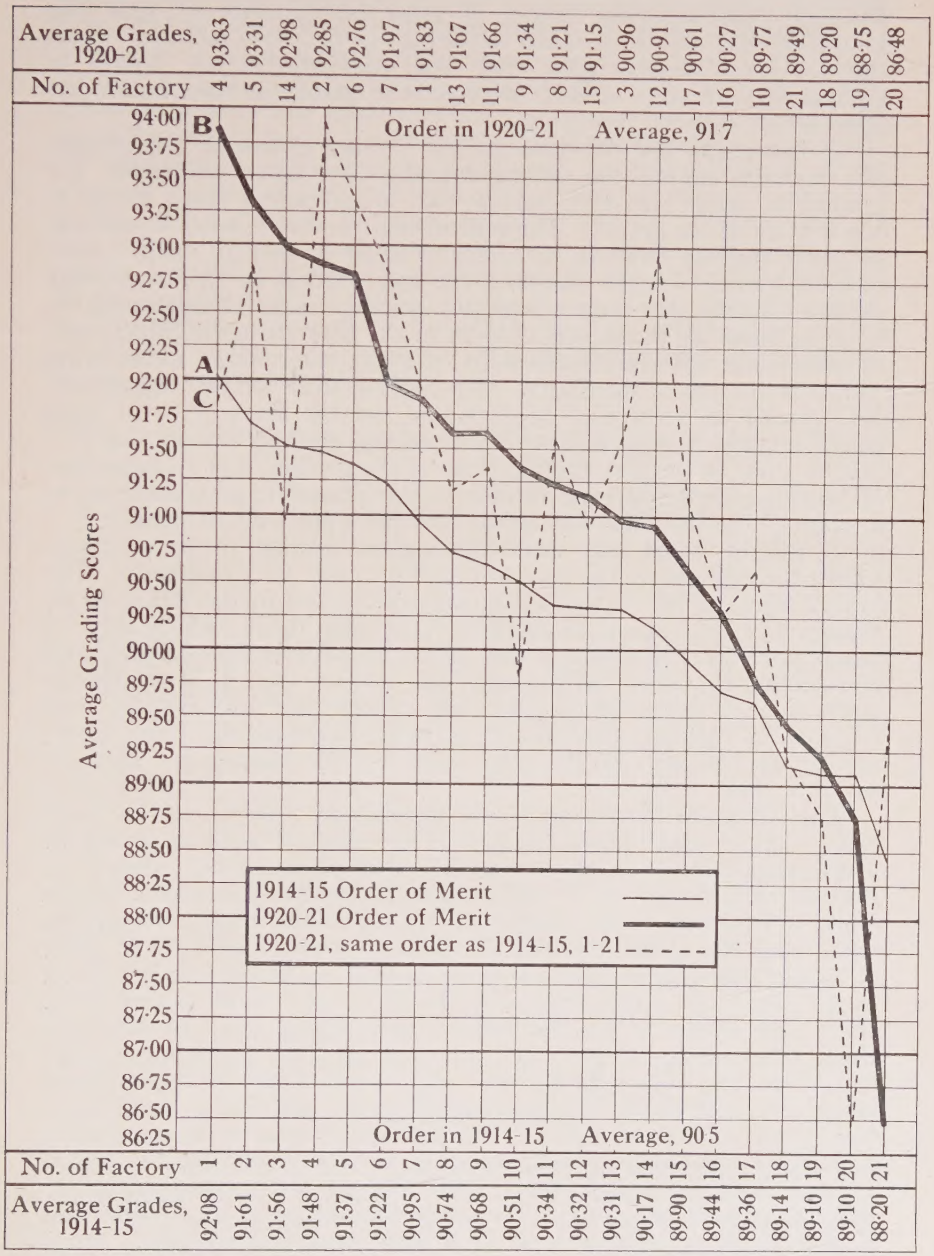
with the consent of the factory already supplied. Safeguards were provided whereby any supplier changing his place of residence or having any other legitimate reason for changing to another factory during the season could do so. This agreement has been conscientiously carried out by the factories concerned, though a certain amount of flexibility has been allowed which has been to the benefit of all concerned. As a minimum the difference between the price paid for first and second grades was fixed at ½d. per pound, but this has since been increased to 1d. by some factories. Many other important matters have been dealt with by the conference at the annual meetings held since, but the cream-grading and any adjustment connected therewith have always taken precedence over any other business coming before the delegates.

At the meeting held on 4th June, 1918, a motion was carried recommending the adoption of a system of grading on points, and this has since been the practice in most factories. Under this system an extra ¼d. to ½d. per pound of fat is paid on all cream scoring 92 points or over, usually called superfine quality. The ordinary advance is made on first-grade cream scoring from 88 to 91 points, and ½d. to 1d. less is paid on all cream scoring below 88 points, known as second grade. By the pointing system the supplier is kept in touch with the quality of his cream, and if just keeping above second grade is warned of his position. If just short of superfine he is encouraged to make an effort to get the extra point and the higher price. Some factory-managers have made a practice of scoring only up to 92 points, though admitting that much of the superfine cream was worth a higher score. This does not encourage the spirit of rivalry among suppliers, which is one of the great points in favour of the system. In other cases the cream is pointed, but no difference is made between the price of first and superfine grade. The result is that the keen supplier does his best and the careless man simply carries on as usual.

As might be expected, there has been a certain amount of variation in the way in which the grading has been carried out by different managers. Some have shown great enthusiasm and have done the work in a very thorough manner, and the results attained have been highly satisfactory. Others have graded, but in a more or less superficial manner and with corresponding results, while others, either through force of circumstances or want of inclination, have not graded at all. Though the original system of grading did much to improve the quality the adoption of the pointing system did a good deal more, and here again it was the enthusiasts who got the results.

Following the change from whole milk to home separation there was an inclination to allow too much latitude in the matter of deliveries. Added to this was the lack of experience in the handling of cream on the farm on the part of suppliers, and a good deal of energy was expended in attempts to make a high quality of butter from a very inferior cream-supply. Naturally, under such conditions it took some time for the grading system to make much impression, but after seven years it is possible to draw some conclusions which will be fairly reliable.

With this object Graph No. 1 has been prepared, showing the improvement in the quality of the butter made by the twenty-one factories concerned since the adoption of the grading. While admitting


Average Grades, 1920-21
4 93·83
5 93·31
14 92·98
2 92·85
6 92·76
7 91·97
1 91·83
13 91·67
11 91·66
9 91·34
8 91·21
15 91·15
3 90·96
12 90·91
17 90·61
16 90·27
10 89·77
21 89·49
18 89·20
19 88·75
20 86·48
No. of Factory
Order in 1920-21 Average, 91·7
B
A
C
Average Grading Scores
94·00
93·75
93·50
93·25
93·00
92·75
92·50
92·25
92·00
91·75
91·50
91·25
91·00
90·75
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89·00
88·75
88·50
88·25
88·00
87·75
87·50
87·25
87·00
86·75
86·50
86·25
1914-15 Order of Merit
1920-21 Order of Merit
1920-21, same order as 1914-15, 1-21
Order in 1914-15 Average, 90·5
No. of Factory
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Average Grades, 1914-15
92·08
91·61
91·56
91·48
91·37
91·22
90·95
90·74
90·68
90·51
90·34
90·32
90·31
90·17
89·90
89·44
89·36
89·14
89·10
89·10
88·20

GRAPH NO. 1.

that a certain amount of this improvement may be due to better equipment in factories and a more intimate knowledge of the best means of handling home-separated cream, it must be remembered that this knowledge has also been taken advantage of by those factories which did not grade, neither have they been neglectful in the matter of equipment. In spite of this, however, the quality of their butter has gone down in nearly every case.

In this graph line A represents the average grades of the twenty-one factories during the season 1914–15—the season in which the grading of cream was first started—the actual scores being shown at the bottom of the graph. The highest score is No. 1, with an average of 92·08, running down in the order of merit to No. 21, with a score of 88·2, a range of 3·88 points. The true average of the twenty-one factories during that season was 90·5 points. Line B represents the same factories for the season 1920–21 in the order of merit (which was, of course, not the same order as in 1914–15), the average scores being shown at the top of the graph. The highest score for that season was No. 4, with an average of 93·83 points, and the lowest No. 20, with 86·48, a range of 7·35 points. The average for this season was 91·7 points, a rise of 1·2 since the inception of the grading, and a comparison of lines A and B will give an idea of the general improvement made in spite of the fact that five of the factories went back in quality.

It will be noted that while the highest average in 1914–15 was 92·08, the highest in 1920–21 was 93·83, a rise of 1·75 points. The lowest score in the former season was 88·20, and in the latter 86·48, a drop of 1·72 points, or practically the same figure, which may be taken as a fair indication of the difference between the grading and non-grading systems. While only one factory (No. 1) was able to reach a score of 92 in 1914–15, this average was exceeded by five factories in 1920–21, the amount of butter produced by them representing 21 per cent. of the total make for the twenty-one factories under review.

Line C shows the scores of the factories in 1920–21 in the same order, 1 to 21, as on line A, but not in the order of merit as on line B. Thus every factory on line A has its position for 1920–21 shown on the same vertical line at C, and its actual score for that season can be found by referring to its number at the top of the graph. It will be noted that No. 4 has improved its position from 91·48 at A to 93·83 at C, and now occupies first place in the order of merit, line B. No. 5 comes next with a rise from 91·37 to 93·31, and takes second place. No. 14 has made the greatest improvement, rising from the comparatively poor average of 90·17 in 1914–15 to the very fine score of 92·98 in 1920–21, and taking third place. No. 1, which had the highest score in 1914–15 with 92·05, has gone back to 91·83, and has as companions Nos. 3, 10, 19, and 20. No. 1 is an instance of what is not uncommon in factory work when, despite every effort, the results for the season are not what one would expect. For the current season this factory has an average of 93·14. The other four factories have either not graded at all or have done so in a very superficial manner. No. 3 as a result has fallen away from 91·56 to 90·96, and takes only thirteenth place, an instance of pointing but not paying for superfine grade. No. 10 has dropped from 90·51 to 89·77, and falls back to seventeenth place, no grading having been done in the meanwhile.

During the current season this factory is pointing the cream and paying on grade for the first time, and has scored an average of 91·72. No. 20 has dropped until the average is below second grade, the result of no grading and a very infrequent system of cream-collection.

Almost without exception the improvement in quality has corresponded with the amount of care shown in the work of grading, while a drop in quality has followed when the system has not been in use, clearly indicating that a flat rate of payment has the effect of encouraging carelessness on the part of suppliers. As an illustration of the range of quality in the cream received under an efficient system of grading, reference may be again made to No. 14. Starting with a very inferior average quality of cream in 1914–15, as indicated by the quality of the butter made, this company has consistently graded, and for the purpose of a competition among the suppliers prepared a statement showing the average of the points scored by each supplier for the six months of the export season. The numbers as here given are not in the same order as published by the company.

Table 1, showing Average Grades of Suppliers' Cream received at Factory No. 14, Season 1920–21.

No.	District I.	No.	District II.	No.	District III.	No.	District IV.	No.	District V.
	Points.		Points.		Points.		Points.		Points.
1	92·40	7	90·18	23	92·70	44	89·00	55	93·87
2	93·14	8	90·80	24	93·00	45	..	56	91·70
3	91·70	9	90·68	25	91·80	46	88·70	57*	90·80
4	91·30	10	90·60	26	92·20	47*	90·50	58	91·00
5	91·70	11	91·20	27	90·90	48	91·17	59	92·10
6	93·22	12	90·80	28	90·20	49	89·00	60	92·30
..	..	13	90·50	29	91·60	50	89·70	61	92·40
..	..	14	90·90	30	91·60	51	89·00	62	92·00
..	..	15	91·50	31	91·40	52*	89·00	63*	93·04
..	..	16	90·60	32	91·30	53	90·38	64	94·00
..	..	17	91·55	33	91·30	54	89·60	65	92·58
..	..	18	91·40	34	91·70	..	..	66	92·76
..	..	19	92·10	35	91·70	..	..	67*	92·18
..	..	20	91·10	36	91·70	..	..	68	93·13
..	..	21	91·80	37*	91·60	..	..	69	92·62
..	..	22	91·90	38	92·85	..	..	70	93·65
..	..	..	..	39	93·21	..	..	71	92·65
..	..	..	..	40	91·11	..	..	72	93·00
..	..	..	..	41*	91·60	..	..	73	92·69
..	..	..	..	42	91·70	..	..	74	92·58
..	..	..	..	43	91·17	..	..	75	92·81
Averages	92·243	..	91·10	..	91·73	..	89·605	..	92·56

* Using milking-machines.

The company's territory is divided into five districts. No. I runs from suppliers 1 to 6 inclusive; No. II, 7 to 22; No. III, 23 to 43; No. IV, 44 to 54; and No. V, 55 to 75. The suppliers using milking-machines are marked with an asterisk. The conditions for the collection of the cream are about the average prevailing in the North and for the period during which the averages were made up; the cream was collected every other day, including Sundays.

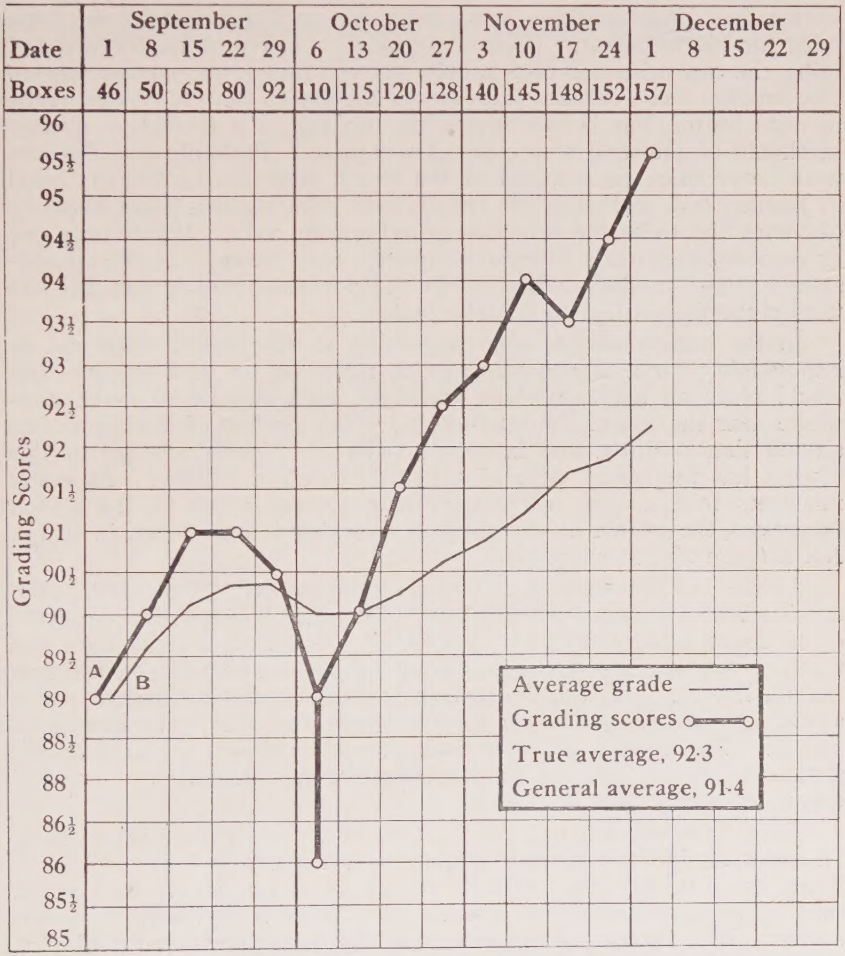
It will be noted that the quality of the cream received from milking-machine sheds is practically the same as that received from the hand-milking dairies, the range being from 93·04 to 89 points. The argument that it is not possible for a large supplier to deliver cream of as high a quality as a small supplier is not borne out by the results shown by No. 63, which is a fifty to sixty cow herd, and had an average of 93·04 points, coming out eighth among seventy-four suppliers. While it is admitted that it requires more care for a machine-shed to supply a high-quality cream, that is only because there is more machinery to keep clean. A study of the points awarded to some machine-milked cream at the factory will show that they run from superfine immediately following the periodical clean up down to second grade as the machine gets more foul. Other machine-users, following an efficient system of cleaning their plants (chiefly the use of plenty of cold water followed by soda-water, then scalding with an ample supply of *boiling* water after *every* milking), can supply cream which is quite as good as that milked by hand. On the other hand, as a result of neglect, the hand milker frequently sends in cream which is quite as bad as machine-milked cream, as shown by the averages here given.

Taking individual suppliers, the results shown by Nos. 2 and 3 are interesting by the fact that these two lots of cream come from one farm divided between two members of the family, the conditions, as far as it is possible to judge, being exactly similar. No. 49 is also worthy of notice. This farm was held by two different owners during the season. The first one argued that it was not possible to deliver superfine cream in the circumstances in which he was placed. His average for the first portion of the season was 89, as shown, while the new owner averaged 93·2 for the remaining months. The only difference in the conditions was cleanliness.

Comparing the scores from the different districts, No. V has the highest average with 92·56 points, No. I has 92·273, No. III is third with 91·73, No. II fourth with 91·10, and No. IV has the poorest average of 89·605. With the exception of No. IV conditions are as nearly as possible equal for the production of good cream, and from a first-hand knowledge of practically the whole of the dairies in those districts the writer can say that the cream averages are a correct indication of the condition of the premises in each. This affords a further proof, if any such proof were required, that cleanliness is the first essential in the production of high-grade cream. Obviously the cream which has not been contaminated will not develop unclean flavours. The dairies in No. V district are almost without exception spotlessly clean, and the utensils bright, indicating that they are scalded in boiling water; also in most cases the dairies are fitted up with some means of cooling the cream. The district III dairies are well kept, but not so well equipped, with surroundings and atmosphere not quite so clean. In No. II district the state of the utensils indicates that they are not so carefully handled and are seldom scalded; there are few coolers, and the atmosphere and surroundings are not clean.

Experience has proved conclusively that the great bulk of the defective cream received at the factories is caused by dirt and neglect, and that an effective system of grading results in a very much improved

cream-supply, with a corresponding rise in the quality of the butter made, provided the factory is properly equipped and sufficient skill is shown in the manufacture of the butter. A carelessly managed factory will seldom be found to have a good cream-supply, but it is only under exceptional circumstances that a well-managed factory has a poor supply.



GRAPH NO. 2 (SEE NEXT PAGE).

With a view of checking the correctness of the cream-grading, experiments have been carried out from time to time, and the culling-out of the secondary qualities invariably resulted in an improvement in the score of the butter made from the better class of cream. The practice of making two brands of butter has not been common in the North, however, where a number of factories have proved that the cream-supply can be brought up to a quality which will admit of the

whole of the butter made scoring a high average. One would hesitate to suggest that a second brand was necessary where a factory output scored round 92 points for the whole season.

Feed flavour is a subject which exercises the minds of suppliers and is thought by many to be an injustice to the person concerned. The supplier who has a farm which produces cream which is tainted with a weed flavour is unfortunate, but if the result is a poorer quality of butter, and consequently a poorer price, he can hardly expect the same price for his butterfat. That a secondary quality of butter will not bring the top price has been amply proved during the current season. The supplier has a certain claim on the factory to have his cream made up into butter, but if this entails the making of a secondary quality he should be prepared to accept a lower price. Probably feed flavours were never more pronounced in the North than during the dry spell in January last, and when two brands were being made a larger quantity of cream had to be put into the second-quality vats. Where only one brand was being made the general quality went down. In the circumstances, those suppliers whose cream did not show feed or dirt flavours were certainly entitled to a higher price.

In the early days of home separation it was looked upon as an impossibility for a factory-manager to make butter of a quality that would score an average which would be high enough to reach anywhere near the top of the grading-list. The grading of the cream has altered that position, and in recent years the highest average in this district has frequently gone to a home-separation factory. As many managers take a keen interest in their average grade as the season progresses, the system of recording and working it out shown in Graph No. 2 (page 263) is suggested.

At the top is shown the date and the number of boxes in each consignment forwarded for grading. The first consignment consisted of 46 boxes forwarded on 1st September. Later on a grade-note was received showing a score of 89 points, which is indicated by the first dot on line A. On 8th September 50 boxes were despatched which scored 90 points, and so on right through the season, as shown on line A. The average grade to date can be recorded on line B as the season progresses, and can be ascertained in the manner here described after each grade-note is received.

Table 2 (on opposite page) shows the average grade during the season. In order to find the average grade as each grade-note is received it is necessary in the first instance to fix on a minimum score, which may be anything, and in this case has been taken as 86, the lowest points scored. Every point scored above 86 is treated as excess over minimum, and must be multiplied by the number of boxes in the consignment. The first consignment of 46 boxes scored 89 points, or 3 points over minimum; therefore $46 \times 3 = 138$, the excess points scored by the consignment. The average grade at this stage will necessarily be 89. The next consignment of 50 boxes scores 90 points, or four above minimum; therefore $50 \times 4 = 200$ excess points for the consignment, which added to the 138 points for the previous lot gives 338 excess points for 96 boxes. Now, $338 \div 96 = 3{\cdot}520$, which is the average of the excess points to date; therefore $86 + 3{\cdot}520 = 89{\cdot}520$, average grade to date.

Looking down the list it will be noted that on 6th October 10 boxes scored only 86 points. The total number of boxes is therefore increased by 10, to 343, while the total excess points to date remains at 1,477. As a result the average grade drops from 90·435 (1477 ÷ 333 + 86) to 90·306 (1477 ÷ 343 + 86), and the balance of the consignment (100 boxes) scoring only 89 points further reduces it to 90. Should the grade fall

Table 2. Record of Consignments and Average Grade of Butter through the Season.

Date.	Grade.	Boxes Butter.		Excess Points.		Average of Excess Points to Date.	Minimum Points.	Average Grade to Date.
		In Consignment.	Total to Date.	For Consignment.	Total to Date.			
September 1 ..	89	46	46	138	138	3·000	+86	89·000
,, 8 ..	90	50	96	200	338	3·520	+86	89·520
,, 15 ..	91	65	161	325	663	4·117	+86	90·117
,, 22 ..	91	80	241	400	1,063	4·410	+86	90·410
,, 29 ..	90½	92	333	414	1,477	4·435	+86	90·435
October 6 ..	86	10	343	..	1,477	4·306	+86	90·306
,, 6 ..	89	100	443	300	1,777	4·000	+86	90·000
,, 13 ..	90	115	558	460	2,237	4·000	+86	90·000
,, 20 ..	91½	120	678	660	2,897	4·273	+86	90·273
,, 27 ..	92½	128	806	832	3,729	4·626	+86	90·626
November 3 ..	93	140	946	980	4,709	4·977	+86	90·977
,, 10 ..	94	145	1,091	1,160	5,869	5·379	+86	91·379
,, 17 ..	93½	148	1,239	1,110	6,979	5·632	+86	91·632
,, 24 ..	94½	152	1,391	1,292	8,271	5·946	+86	91·946
December 1 ..	95½	157	1,548	1,491	9,762	6·300	+86	92·300

True average, 92·3. General average, 91·4.

below minimum the points lost on the consignment must be deducted from the aggregate to date. A few moments' work on receipt of each grade-note will give the true average to date, and it will be noted that in the example given the true average is very different to the general average. In keeping a record of the average grade it is well to remember that the official year commences on 1st April and ends on 31st March.

Farm Training-schools.—During a discussion on rural education at the last meeting of the Board of Agriculture it was agreed that inquiries should be made with regard to various legacies that have been made for the purpose of encouraging agricultural education. It was further decided that the time had arrived when the preliminary steps should be taken towards the establishment of one or more permanent farm training-schools, and that sketch-plans should be prepared for the buildings necessary for a school of fifty pupils, and submitted, together with an estimate of the cost, to the Board at a future meeting.

International Conference of Sheep-breeders.—The Department has been advised by the National Sheep-breeders' Association (England) that the twenty-first International Conference of Sheep-breeders will be held at Cambridge on 3rd July next, the day preceding the opening of the Royal Agricultural Show in that town.

THE GRASSLANDS OF NEW ZEALAND.

PRINCIPLES OF PASTURE ESTABLISHMENT.

(Continued.)

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TEMPORARY PASTURES.

THE species of grasses and clovers used in the sowing-down of temporary pastures are rapid to establish and quickly productive of feed. Italian rye-grass, Western Wolths rye-grass, and red clover or cow-grass are the main species used. All are short-lived plants, and therefore occupy the ground only for a comparatively short period. From this fact the pastures which they constitute are called temporary pastures.

MAIN OBJECTIVES.

In the sowing-down of temporary pastures any of three main objectives may be in the mind of the farmer: (1) To suppress weed-growth; (2) to tide over crucial periods of the year; (3) to initiate the breaking-in processes of various lands. Just how the temporary pasture functions towards these objectives will be clearer after considering each in detail.

Suppression of Weed-growth.

We have seen that in nature there is a continual struggle, and that the suppression or otherwise of one class of vegetation is determined by whether or not it is competing with a more or a less vigorous rival. If the class of vegetation that is sown is more rapid to establish and more vigorous in growth than are the weeds occupying that soil, then the weeds will be suppressed. This is one of the great principles in weed-suppression—namely, to suppress weed-growth by a plant or plants more vigorous than the weed and by one that is of value to the farmer. Farm economy demands that an adequate return for labour expended must be secured, and the sound weed-control method is that which pays its way while the operation is proceeding. Weed-suppression by a cover-crop that is of value to the farmer is sound in that it pays its way by the crop which is produced. It will be recognized that plants used for such cover-crops must be rapid to establish and form from an early period of their growth a dense cover. Apart from such crops as oats and tares—excellent in themselves for this work—reliance must be placed on certain of our pasture-plants, and Italian rye-grass, Western Wolths rye-grass, and red clover stand out pre-eminent in this respect. Not only do these function as weed-controllers by their capacity to smother, but they allow of heavy stocking soon after sowing, thus bringing into play the second great factor in weed-control.

In the use of these species it must be firmly borne in mind, however, that their life is short, and that after the second year there will be a thinning-out in the sole. Such thinning-out offers opportunity for

FIG. 60. AUTUMN-SOWN TEMPORARY PASTURE, EIGHT MONTHS OLD, SHOWING THE RYE-GRASS THINNED OUT AND THE RED-CLOVER GROWTH BEGINNING TO COME AWAY.

Up to this point the feed has been almost entirely rye-grass.

FIG. 61. AFTERMATH OF RED CLOVER COMING AWAY TOWARDS THE END OF DECEMBER, PROVIDING EXCELLENT SUMMER GRAZING.

fresh weed-invasion, and if the pasture is left down much of the good work done in the early stages will soon go for nought. Properly managed, however, the temporary pasture is one of the most efficient factors in weed-control on ploughable country.

Tiding over Crucial Periods of the Year.

As a special supplementary crop to tide over crucial periods temporary pastures are invaluable. When autumn-sown they may be utilized as winter and early spring feed; such feed will be almost entirely rye-grass (Fig. 60). In the flush of the ordinary permanent pastures they may be shut up for a hay crop, and the aftermath of such, which in the main is red-clover growth (Fig. 61), may be utilized as a grazing-crop in the summer when the ordinary pastures are beginning to go off; or, if the crop is not needed for grazing, a good second red-clover hay crop can be secured (Fig. 62). When spring-sown excellent summer and late autumn pastures result, which are of much value at weaning-time and to augment the rapidly declining feed of the permanent pastures that support the dairy herd. For only one year, however, do temporary pastures function well as supplementary feeds, although quite a good pasture still remains for ordinary grazing purposes for a second and even a third year (on the best of land), but in such years the periods of growth coincide in the main with those of the ordinary permanent pastures, so that as special supplementary feed temporary pastures are of little value after the first twelve months.

As an Initial Breaking-in Crop.

One of the essentials of a breaking-in crop, particularly in pioneer work, is a rapid return of money, and often this fact demands a crop which may not be the best possible one in order to ensure conformity with the theoretical demands of sound breaking-in operations so far as soil-fertility and soil-texture improvement are concerned. Again, generally speaking, the sowing must not be expensive. An oat crop is commonly used on the first furrow, this being necessary to supply feed for the team and as a cash crop to tide over the period, monetarily, before stock can be run on the place. Turnips and swedes are also regularly used as a pioneer crop, and these may either be consumed by the stock on the farm or else be sold as a cash crop to be fed off by the stock of better-established neighbouring farmers, or stock may be bought in and sold again as soon as the crop is eaten off. Neither of these crops, however, is in any way ideal from the soil-improvement or the weed-control point of view.

The main requirements in connection with a sound breaking-in crop, other than from the monetary point of view, are as follows: (1) On sandy soils, consolidation and increase of humus; (2) on heavy clay soils, opening up and increase of humus; (3) on peaty soils, consolidation; (4) the increase, if possible, of soil-fertility, such as is provided by a legume; (5) some strong-growing plant, to compete with any reappearing undesirable vegetation, such as fern, &c.

Generally speaking, it is not a sound business proposition to grow crops specifically for the sake of turning in for the one purpose of increasing the humus content of the soil, but a crop that will give a certain amount of feed and yet supply a good aftermath which may be turned

FIG. 62. TEMPORARY PASTURE, ONE YEAR OLD, WHERE THE RED CLOVER HAS BEEN ALLOWED TO RUN FOR A HAY CROP.

The rye-grass has almost entirely disappeared. Generally, however, sufficient reseeding of rye-grass occurs in this second growth to ensure that a mixed grass and clover sward will be maintained during the following year.

FIG. 63. ALSIKE ESTABLISHED IN A LATE AUTUMN-SOWN PASTURE, IN WHICH MOST OF THE RED CLOVER FAILED TO ESTABLISH OWING TO THE LATENESS OF THE SOWING.

in is a sound proposition. The temporary pasture, with its aftermath of red clover, functions well. On sandy soils and on peaty soils, where the surface dries out rapidly on the approach of summer, full advantage must be made of the early spring and late autumn periods for the establishment of pasture-plants. Rapidly-establishing plants alone are of value, and such plants must be of such a nature that they may be grazed *in situ*, in order that consolidation may be effected by the treading of the animals grazing upon the crop. The value of the temporary pasture in the bringing-in of peat-swamp lands has been referred to in a previous article. The effect of the oat crop and of the root crop, particularly so if the roots are carted off, is to impoverish the soil; and while the temporary pasture requires feeding with artificial manures, yet the aftermath of clover will do a great deal to increase the fertility of the soil as far as the nitrogen content is concerned.

Perhaps, however, the temporary pasture has its greatest value in the control of the weed vegetation that makes its appearance either from the weed-seeds that are present in the soil or from those portions of underground stems and roots which have not been killed out by cultivation. Fern and blackberry may be cited as the two troublesome plants of this latter kind. In their suppression two features of control are extremely important. Firstly, the plants sown must be rapid to establish, so that stocking may be done while the fern is in the curl stage, and while the blackberry-shoots are young and tender; and, secondly, the crop must form an effective smother. The combination of the smother and the eating or breaking-off of each young frond or shoot as it makes its appearance above ground soon tells on the vigour of the plant, and provided the growth of grass can be maintained the weed will ultimately die through exhaustion. The production of young fronds and of young shoots is all done at the expense of food materials stored in the roots or underground stems. Not until the leaves have expanded is the plant able to elaborate fresh food materials to compensate for the production of such fronds and shoots. The value of a crop that allows of feeding off when the fern is in the curl stage and when the blackberry-shoots are young and tender is readily perceived. The temporary pasture functions well in this respect.

It will be obvious from the foregoing considerations that the temporary pasture plays a very important role on all ploughable lands, but it is very necessary to recognize that these pastures are temporary and cannot replace the longer rotation pasture nor the permanent pasture. Two years should be set down as the maximum period of their production, and if they are left down for longer than this invasion of weeds and inferior grasses is bound to take place. On good first-class land white clover frequently comes in on the running-out of the red clover and rye-grass, and may form a dense sole to the exclusion of all else.

SPECIES OF GRASSES AND CLOVERS USED IN TEMPORARY PASTURES.

As previously indicated, the three outstanding species used are Italian rye-grass, Western Wolths rye-grass, and red clover or cow-grass. Other clovers are often recommended, particularly crimson clover, Egyptian clover, and alsike, but for general purposes red clover undoubtedly is the best. Alsike may often replace red clover, however,

FIG. 64. WESTERN WOLTHS RYE-GRASS, TWO MONTHS OLD, SHOWING THE ERECT GROWTH AND DENSE COVER FORMED.

The red clover here has been quite unable to establish owing to the rye-grass being allowed to get away.

FIG. 65. ITALIAN RYE-GRASS, TWO MONTHS OLD, SHOWING ITS LESS ERECT HABIT AND SHORTER GROWTH COMPARED WITH WESTERN WOLTHS, AND DEMONSTRATING THE MORE SUCCESSFUL ESTABLISHMENT OF RED CLOVER WHEN SOWN WITH A LESS VIGOROUS-GROWING PLANT.

In both of these pastures 6 lb. of red clover per acre was sown with the rye-grass.

and particularly on saline soils and under damper conditions generally. In very late autumn sowings, also, alsike is more likely to be successful than is red clover, owing to the fickleness of red-clover establishment in late autumn (Fig. 63).

In the choice between Western Wolths rye-grass and Italian rye-grass, Western Wolths (Fig. 64) is more rapid to establish, is more upright in growth, and can be fed off sooner than Italian. It is, however, more essentially an annual than is Italian, and where the objective is rapidly produced feed and for one year only, then Western Wolths is preferable to Italian. For temporary pastures of two years' duration Italian (Fig. 65) is recommended in preference to Western Wolths. Again, if kept grazed down Western Wolths forms a much more open sole than does Italian, and for this reason the establishment of red clover should be more certain along with Western Wolths than with Italian, provided the growth is kept short. With either of these grasses, however, there is the danger of allowing them to get away too far before being grazed, and often the red clover in such paddocks may be entirely smothered out (compare Figs. 64 and 65). We must realize, therefore, that the red clover is much slower to establish than the rye-grass, and that care must be exercised in order that the former is not smothered.

Mixtures recommended.

The following mixture is recommended for general temporary pasture sowings: Italian rye-grass 25 lb., red clover 6 lb.; total, 31 lb. per acre. For more quickly produced feed and for pastures of one year's duration the following may be sown: Western Wolths rye-grass 25 lb., red clover 6 lb.; total, 31 lb. per acre.

(To be continued.)

IMPORTATION OF FERTILIZERS, 1921-22.

THE ANNUAL STATISTICS AND SOME NOTES.

B. C. ASTON, F.I.C., F.N.Z.Inst., Chemist to the Department.

STATISTICS of artificial fertilizers imported into New Zealand during the year ended 31st March, 1922, are now (by the courtesy of the Comptroller of Customs) available, and, together with other data, have been specially compiled for the *Journal* in the accompanying tables.

The severe agricultural depression of 1921 was, no doubt, mainly responsible for the gross weight of imported fertilizers for the year under review being only about one-half of the quantity imported during the previous twelve months. In examining these figures in detail one finds that the deficiency must be placed against superphosphate and guano or rock phosphate. In bonedust there is not much difference in the figures for the two years. In basic slag there is a distinct advance—some 2,600 tons more being imported. An interesting departure in the case of slag is the entry of the United States into the New Zealand market, some 500 tons of American slag having been

imported from Tennessee to New Plymouth. The writer is informed by the district Instructor that the method of packing and the fineness of the American article left nothing to be desired. The method of packing adopted was unusual, paper bags being used as receptacles, enclosed within fabric of more durable material, thereby largely diminishing the dust nuisance and the liability to become damp. Phosphate dust is peculiarly objectionable on the skin, and excess is liable to cause waterside trouble, to say nothing of the waste of raw material. Anything novel from America in the matter of handling fertilizers is in this country, in which such relatively large quantities are used, certainly worthy of study.

The slump in the importation of superphosphate is due to more than one cause. The large stock of Japanese and other superphosphate held over from the previous year, and the establishment of a superphosphate-factory in Auckland, contributed to the result brought about by the main cause already mentioned.

"Rock phosphate and guano" is really a duplication of terms, as the meanings have become synonymous—at least, no distinction can now be drawn between these materials. The term "guano" used to be restricted to recent bird-excreta obtained from some of the small islands off the coast of South America, where a valuable fertilizer was dug out, put on the market, and generally known as Peruvian guano. Being highly nitrogenous as well as phosphatic it commanded a high price. If any of this is now obtained it is infinitesimal in amount compared with the enormous quantity of fossil bird-excreta mined at the Pacific islands, and other mineral phosphates from which all but traces of the organic matter have been destroyed by weathering, leaving only the mineral or phosphatic part. In the case of the Pacific islands the phosphate has been fixed by the calcareous coral rock and become to all intents and purposes a mineral.

Considering all things, the deficiency in rock phosphate and guano imported is not as great as one might have expected. There are signs that the farmer is awakening to the value of finely ground high-grade island phosphate rock such as that of Nauru, when used on the right type of soil and in the right climate. The quality of the soil, provided it lacks phosphate, does not seem to be so important a factor as the climate. The Department has had great success with finely ground Nauru phosphate on the most diverse kinds of soil, such as the following: (1) Coarse sandy and gravelly pumice soils (when top-dressing permanent pasture) on the North Island volcanic plateau; (2) a stiff white pipeclay of the common heavy gum-land type (when sown with grass-seed) in North Auckland; (3) white papa clay, rather impervious to water (on fiorin grassland), in North Wairarapa; (4) South Wairarapa soils (on rape crops); (5) King-country light loam (on grassland); and (6) Upper Hutt boulder gravels (on grassland). In addition to these recent experiments there are others recorded with similar finely ground rock phosphate, which were made on the Moumahaki Experimental Farm as long ago as 1905, and were continued over a series of years, proving the value of raw phosphates when drilled in with root-crops. The farmers of New Zealand have, however, yet to realize fully the precious heritage they are leaving to their children in cheap Nauru and Ocean Island phosphate.

SUMMARY OF KINDS, QUANTITIES, AND DECLARED VALUES OF FERTILIZERS IMPORTED DURING YEARS ENDED 31ST MARCH, 1921–22 AND 1920–21.

Fertilizer.	Weight.		Value.	
	Year 1921–22.	Year 1920–21.	Year 1921–22.	Year 1920–21.
	Tons.	Tons.	£	£
Bonedust	4,063	4,440	46,981	65,183
Bone char	594	1,033	4,004	7,710
Blood-and-bone	50	256	707	4,864
Basic slag	13,488	10,823	83,539	104,428
Egyptian basic phosphate	..	10,810	..	76,186
Superphosphate	3,140	40,731	21,906	260,542
Guano and rock phosphate	45,956	70,208	103,245	186,690
Potash	2,420	1,143	16,660	18,459
Gypsum	301	1,381	507	2,908
Sulphate of ammonia	2,058	835	28,846	28,209
Nitrate of soda	204	564	3,920	11,525
Sulphate of iron	26	55	286	593
Manures unspecified	..	78	77	831
Totals	72,300	142,357	310,678	768,128

NOTE.—With regard to the "declared values" given above, the Comptroller of Customs supplies the following explanation: "The value for duty is defined as the fair market value in the country whence the goods are imported, plus 10 per cent. As the addition of 10 per cent. does not cover the present freight, insurance, and other charges, the statistical value is less than the actual landed value."

AVERAGE DECLARED IMPORT VALUES PER TON OF CHIEF PHOSPHATIC AND SOLUBLE NITROGENOUS FERTILIZERS FOR 1921–22 AND 1920–21.

	Year ended 31st March, 1922.	Year ended 31st March, 1921.
	£ s. d.	£ s. d.
Bonedust	11 11 3	14 13 7
Basic slag	6 3 10	9 12 11
Superphosphate	6 19 6	6 7 11
Guano and rock phosphate	2 5 0	2 13 2
Nitrate of soda	19 4 4	20 8 8
Sulphate of ammonia	14 0 4	33 15 8

IMPORTS OF THE PRINCIPAL PHOSPHATIC FERTILIZERS FROM 1912 TO 1922.

Year ended 31st March.	Bonedust.	Basic Slag.	Superphosphate.	Guano and Rock Phosphate.	Egyptian Basic Phosphate.
	PRE-WAR IMPORTS.				
	Tons.	Tons.	Tons.	Tons.	Tons
1912	10,799	16,227	32,567	22,050	Nil.
1913	9,281	20,133	32,964	25,033	,,
1914	6,578	30,350	41,582	22,093	,,
	WAR AND POST-WAR IMPORTS.				
1915	7,966	29,385	54,190	23,983	Nil.
1916	10,059	10,339	58,013	39,366	2,026
1917	10,386	6,660	31,962	24,993	8,614
1918	6,363	10	37,157	37,037	11,225
1919	3,468	Nil	21,400	31,351	Nil.
1920	6,272	2,759	15,842	38,861	15,000
1921	4,440	10,823	40,731	70,208	10,810
1922	4,063	13,488	3,140	45,956	Nil.

IMPORTATION (IN TONS) OF PRINCIPAL ARTIFICIAL FERTILIZERS FOR YEAR ENDED 31ST MARCH, 1922, SHOWING COUNTRIES OF DEPARTURE AND NEW ZEALAND PORTS OF ENTRY.

New Zealand Port of Entry.	Australia.						Chile.	India.	Japan.	United States of America.		Pacific and Indian Ocean Islands.		United Kingdom.			Belgium.		France.		Germany.	Netherlands.
	Nitrogenous Manures.	Bonedust, Blood-and-bone, and Bone Char.	Superphosphate.	Rock Phosphate and Phosphate unspecified.	Gypsum.	Iron Sulphate.	Nitrogenous Manures.	Bonedust.	Superphosphate.	Nitrogenous Manures.	Basic Slag.	Name of Island.	Rock Phosphate.	Phosphate unspecified.	Basic Slag.	Potash.	Basic Slag.	Potash.	Basic Slag.	Potash.	Potash.	Potash.
Auckland ..	43	1,978	..	..	100	..	87	1,975	1,599	..	..	Nauru	14,562	10	850	..	7,014	20	150	393	1,312	..
												Makatea ..	10,102									
												New Caledonia ..	811									
New Plymouth ..	..	..	..	50	..	..	..	..	..	..	500	New Caledonia ..	488	..	..	..	4,550	15	..	..	55	..
Wanganui	..	..	..	..	..	..	..	..	..	..	..	New Caledonia ..	374	..	..	..	..	..	..	..	..	..
Wellington ..	..	..	308	395	200	..	52	160	..	1,037	..	New Caledonia ..	350	..	385	..	149	..	..	105	40	50
Napier ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	..	..
Blenheim ..	..	..	..	..	..	..	..	..	..	..	..	New Caledonia ..	120	..	..	..	..	..	..	..	..	..
Nelson ..	..	..	..	..	..	..	..	..	..	..	..	New Caledonia ..	170	..	..	..	..	..	..	..	..	..
Greymouth ..	..	..	..	..	..	..	..	..	..	..	..	New Caledonia ..	192	..	..	..	..	..	..	..	..	..
Lyttelton ..	..	..	500	250	..	25	..	..	..	988	..	New Caledonia ..	1,100	..	..	20	25	..	..	95	..	..
												Nauru	4,000									
Timaru ..	..	..	625	..	..	..	..	..	..	..	..	New Caledonia ..	537	..	..	..	..	..	..	..	..	..
Dunedin ..	..	..	108	..	..	..	50	..	..	..	..	Nauru ..	7,129	10	..	..	..	..	..	50	20	..
												New Caledonia ..	1,130									
Invercargill ..	5	594	..	..	..	..	..	..	..	..	..	Nauru	3,651	..	..	..	..	..	..	80	..	..
												New Caledonia ..	525									

NOTE.—For the previous year's corresponding statistics see *Journal* of May, 1921, page 278.

SILVER-BLIGHT, STEREUM PURPUREUM PERS.,

ITS APPEARANCE, CAUSE, AND PREVENTIVE TREATMENT.

G. H. CUNNINGHAM, Biological Laboratory, Wellington.

[The following article is the first of a series by Mr. Cunningham on the fungous diseases of fruit-trees and small-fruits, which will be published in the *Journal*. The Director of the Horticulture Division, Mr. J. A. Campbell, will collaborate in those sections of the articles dealing with control measures. It is proposed to reprint each article as a bulletin, and eventually to issue the whole series, together with other useful related matter, in book form.—EDITOR.]

SILVER-BLIGHT ("silver-leaf") is common in orchards throughout New Zealand. It occurs also in Australia, Canada, South Africa, and Europe. This disease attacks a large number of different plants, being common in New Zealand on almonds, apples, apricots, cherries, currants, gooseberries, nectarines, peaches, pears, plums, and quinces, as well as on many ornamental shrubs and trees such as laburnum, lilac, poplar, silver-birch, willow, &c. So far as I am aware, it does not infect indigenous plants.

EFFECT ON THE HOST.

Silver-blight attacks the shoots, stems, and roots of woody plants, its presence first becoming noticeable by a silvering of the leaves (Fig. 2). This symptom as a rule first shows on one or two small branches, and extends rapidly until all the branches on a limb become affected; it then spreads to other limbs of the tree until all become infected. Sometimes the leaves silver simultaneously over the whole tree, but this is not a common manifestation of the disease. Shortly after the leaves show the characteristic silvered appearance the branch begins to decline in vigour and shortly dies, either the same season or after one or several seasons, during which it continues to show leaf-silvering. Where infection is confined to a single branch it would appear that the organism has gained entry through some injury on that particular branch. Where infection is general over the whole tree the organism has probably gained entry through the stem. Infection is almost invariably followed by death of the branch or tree attacked, but occasionally trees have been known to recover. These trees are by no means immune, however, and may succumb to subsequent attack. Silver-blight is not spread by the secateurs during pruning operations, numerous experiments having demonstrated this.

ECONOMIC IMPORTANCE.

This disease is general throughout the orchard areas of New Zealand. Although it attacks pip-fruits its effects on these are not as severe as on stone-fruits. In apple-orchards it probably causes about 1 per cent. loss, on pears its effects are less marked, but with apricots, peaches, and plums the loss is well over 10 per cent., being even more in the case of plums. It probably causes as great a loss as any other orchard disease, with the possible exception of black-spot, but its severity is not readily noticeable, probably because of its gradual onset. A serious feature of the disease is that it cannot be controlled by spraying.

APPEARANCE IN THE FIELD.

The first indication of infection is a silvering of the leaves. Leaves showing silvering become in colour somewhat ashy, tinged with green, and tend to curl slightly at the edges (Fig. 2), so that an infected tree is readily discernible at some distance, the light colour of the leaves showing in marked contrast to the normal dark green of healthy leaves.

a *b*

FIG. 1. STEREUM PURPUREUM PERS.

a. On willow-branch. *b*. On trunk of peach-tree (living). Two-thirds natural size.

[*Photo by E. B. Levy.*

Shortly after the leaves show silvering the branch, as previously mentioned, begins to decline in vigour, then the leaves begin to fall prematurely, until the branch becomes bare, when it stands out prominently. Other branches soon begin to show leaf-silvering, and in turn all branches exhibit this condition, until finally the whole tree becomes infected and dies. The death of an infected branch or even of the entire tree may occur within a short period of the first appearance of silvering of the leaves, but more frequently the tree lives for one or two seasons after its initial infection. Following the death of the tree the fructifications of the causative organism appear (Fig. 1), often

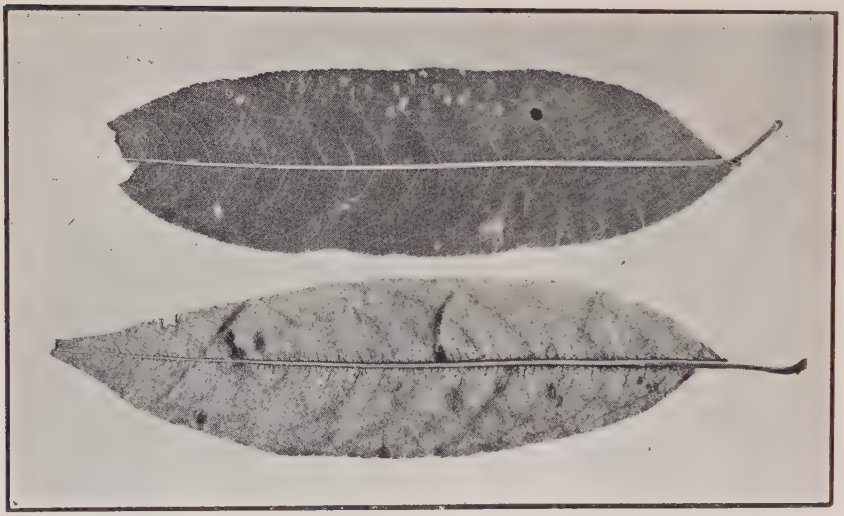


FIG. 2. HEALTHY LEAF AND SILVERED LEAF OF SOLWAY PEACH (UNDER-SURFACE). TWO-THIRDS NATURAL SIZE.

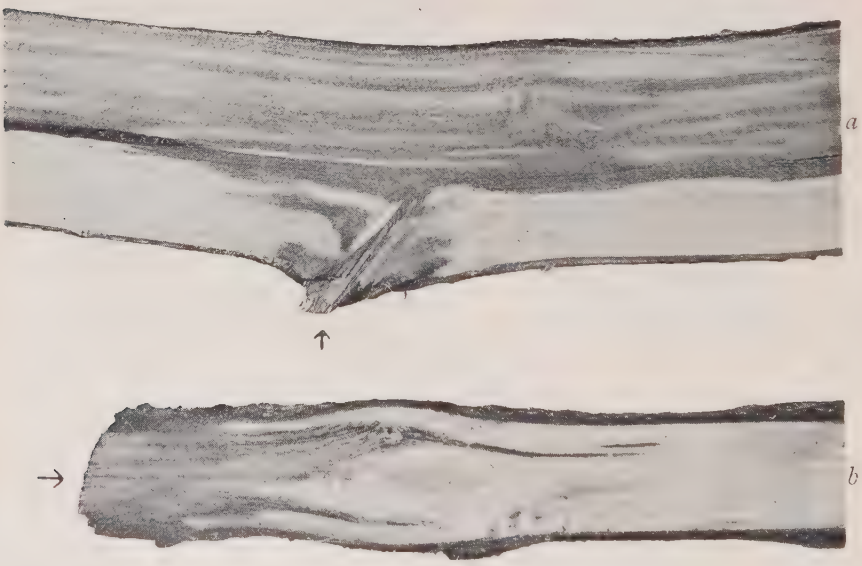


FIG. 3. WOOD INFECTED WITH STEREUM.

(*a.*) Branch of willow, showing area discoloured by the fungus; median section through Fig. 1, a; arrow points to place of entry through stub of branch. Two-thirds natural size. (*b*) Shoot of peach which was showing silvering in the leaves; arrow points to place of entry of fungus through unprotected stub of branch. Natural size.

[*Photos by E. B. Levy.*

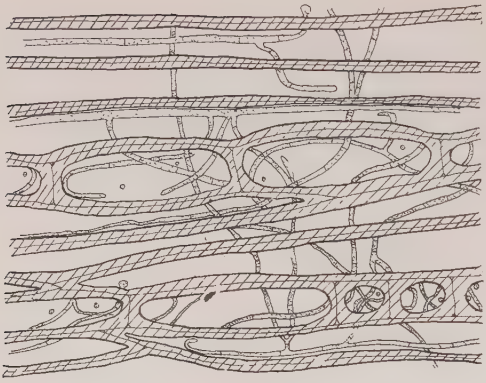
on branches which have died before the whole tree has succumbed. In appearance these are flat, more or less circular disks, having their margins somewhat upturned. They may reach a diameter of 3 in. or more, but commonly they are about 1 in. across. Frequently the upper portion grows away from and at right angles to its support, forming a minute shelf (Fig. 6, a), when the upper surface is seen to be covered with coarse fibres arranged in differently coloured zones. The free surface of the fructification is smooth, and may range in colour from white, through salmon-pink, to purple; usually, however, it is plum-colour. On this surface the spores are borne.

The silvering of the leaves is due to the cells of the epidermis separating from the palisade cells just beneath and becoming somewhat enlarged (Figs. 7 and 8), so that air-cavities are formed which prevent the chloroplasts (bodies containing the green colouring-matter of the leaf) from being clearly seen through the epidermis. The other cells of the leaf also become somewhat disintegrated. The separation of the cells is held to be due to a solvent substance produced by the mycelium of the causative organism, which is situated some distance from the leaves. This substance is carried in the water-conduction vessels of the wood to the leaves, where it acts on the middle lamella (Fig. 5), causing the cells to separate from each other.

A silver-leaf condition similar to the one under discussion is sometimes noticeable on fruit-trees and ornamental shrubs. For example, a silver-leaf condition common on laurustinus (*Viburnum* spp.) and rhododendron is caused by thrips. To distinguish true silver-blight all that is necessary is to scrape the upper leaf-surface gently with a pocket-knife, when the epidermis will readily peel off, exposing the dark-green cell-contents beneath. When a branch is infected with silver-blight the wood subsequently becomes brown in colour, the discoloration first being noticeable where the organism gained entry through a wound in the surface (Fig. 3). This discoloration is not so pronounced in young shoots, where it appears in the form of brown streaks which diminish in size and number towards the apex. Although wood-discoloration invariably follows silver-blight infection cases have been recorded where no visible discoloration has been observed in shoots showing silvered leaves.

LIFE-HISTORY OF THE CAUSATIVE ORGANISM.

For many years the cause of silver-blight was unknown, this condition being attributed to various agencies, such as unsuitable manures, too heavy pruning, &c., until 1902, when J. Percival suggested that the disease was caused by the fungus *Stereum purpureum* Pers., his reason being that this fungus invariably appeared on trees that had been killed by silver-blight. His suggestion was not generally accepted by mycologists at the time, largely owing to the fact that no traces of the mycelium could be found in the leaves. Subsequent inoculation experiments (in which pieces of the fructifications of *Stereum* were inserted beneath the bark of a tree, and invariably within a short time produced the true silver-blight condition in the leaves and the wood) have proved beyond doubt that *Stereum* is the cause of silver-blight.



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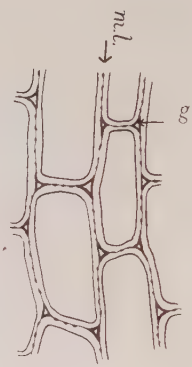

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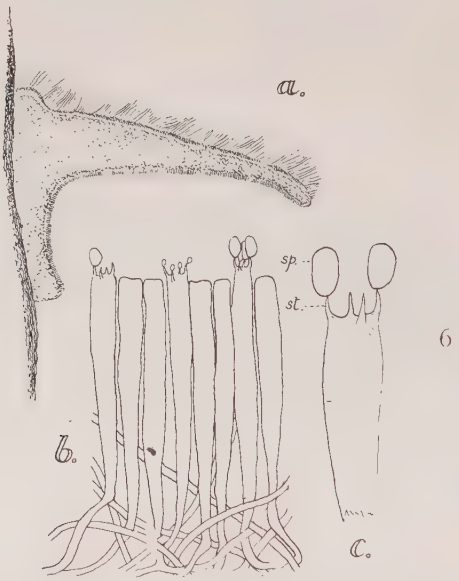

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Fig. 4. Camera lucida drawing of section of wood of willow taken from zone between discoloured and normal wood shown in Fig. 3, *a*. The hyphæ are crowded in the region of the medullary rays. × 500 diam.

Fig. 5. Camera lucida drawing through parenchyma of apple-shoot, showing middle lamella (*ml*), and gussets or thickened portions (*g*), which were at one time intercellular spaces. × 500 diam.

Fig. 6, a. Section through fructification of *Stereum*, showing hairy upper surface and smooth lower surface; the lower surface is the hymenium, or spore-bearing surface. × 6 diam.

Fig. 6, b. Camera lucida drawing of section of hymenium, showing basidia and paraphyses. × 500 diam.

Fig. 6, c. Diagram of basidium, showing sterigmata (*st*), and basidiospores (*sp*). × 1,000 diam.

Stereum purpureum Pers. is a fungus included in the class BASIDIOMYCETES because of the fact that its spores are borne on basidia (Fig. 6, c). A typical fructification consists of a flat disk-like or shelf-like receptacle consisting of closely-packed hyphæ so woven together that it assumes quite a leathery appearance. This receptacle is attached to the bark of the tree by numerous hyphæ which penetrate deeply into the wood. The free surface is lined with a coloured layer, the hymenium, which consists of basidia and paraphyses packed closely together (Fig. 6, b). On the apices of the basidia are four small projections (sterigmata) (Fig. 6, c, *st*) on which the spores (basidiospores)

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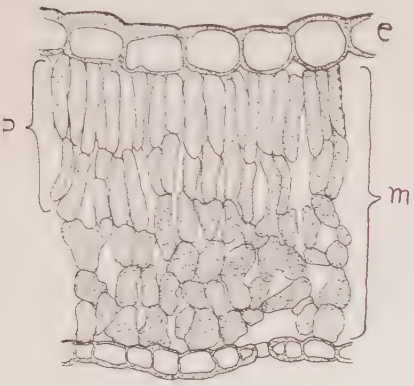

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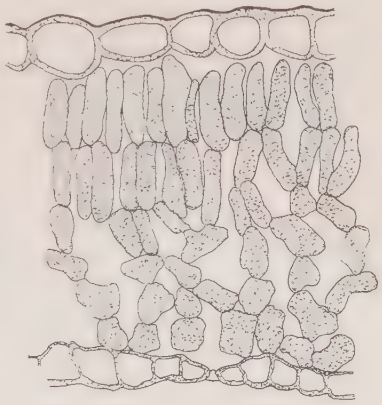

Fig. 7. Camera lucida drawing of section through healthy leaf of peach showing cells containing chlorophyll (stippled), (*m*); palisade cells (*p*); epidermis (*e*). × 350 diam.

Fig. 8. Camera lucida drawing of section of a silvered leaf, showing separation of epidermis from palisade cells, and the disintegration of the mesophyll cells. × 350 diam.

[*Fig. 6 drawn by E. H. Atkinson; other drawings by the writer.*

(Fig. 6, c, *sp*) are borne. The paraphyses are sterile basidia (Fig. 6, b), their function being unknown. The spores are readily detached, and are carried by wind or other agency to trees growing in the vicinity. Should a spore alight on a wounded surface of a tree it germinates and produces a fine germ-tube (hypha) which penetrates the cells of the wood, where it grows and branches repeatedly, the branches (hyphæ) penetrating into the killed cells.* *Stereum* is a saprophyte, growing on dead stumps, posts, and fallen logs, but should opportunity arise for its hyphæ to penetrate the living tissues through some wounded surface it becomes an active parasite. In living branches the hyphæ confine themselves to the wood, where they grow towards the apex of the branch much more rapidly than towards the root. When all the cells in the vicinity have been killed, and the branch in conse-

* It is probable that from the tips of these hyphæ is secreted a substance which has a solvent action on the cell-walls. This substance kills the cells in advance of the hyphæ, and acts on them in such a manner that they may readily be penetrated by the hyphæ.

quence has died, hyphæ grow out to the surface, where they branch repeatedly and form the fructifications on which spores are produced, so completing the cycle.

Fructifications, and consequently spores, may be produced at any time of the year. They appear more frequently during wet weather, and favour a moist atmosphere such as surrounds the base of a tree when it is covered by grass or weeds. Spores may be produced at intervals during the life of the fructification, which in many instances persists for several seasons. As previously stated, this fungus can infect living trees only through a wound of some kind. In orchard practice wounds are constantly being inflicted on trees. During cultural operations portions of bark are frequently abraded by chains, swingletrees, or cultural implements. In picking, branches frequently become broken or split at the forks. In pruning, small wounds are made by the secateurs, and large wounds by the use of the saw. Pests such as woolly aphis or cicadas form cankered areas which afford excellent opening for the entry of spores.

PREVENTIVE TREATMENT.

As this fungus is spread by means of spores produced on the fructifications (and by this means alone), and as these spores can gain entry into the tissues of a tree only through a wound or bark injury of some kind, it becomes apparent that by removing the fructifications and coating the wounded surfaces with a protective covering the disease can be kept within reasonable limits, if not combated altogether. The following treatment is recommended :—

Remove and burn all branches and stumps that are showing signs of silver-blight or that have been killed by it. Destroy all dead stumps of shrubs and trees carrying fructifications of *Stereum*. It is not sufficient to cut off the fructifications, as the wood is permeated with the mycelium, which will produce more fructifications as soon as conditions are favourable.

Protect all wounded surfaces over 1 in. in diameter, so that spores cannot enter crevices therein. This first necessitates cutting all broken branches off clean, an operation which should be performed as close to the main branch as possible, so that the wound may quickly callus over. Where a rough surface is left after a saw-cut it should be dressed smooth with a knife. Injuries caused in cultural operations should be dressed smooth, and all loose pieces of bark removed.

Finally, all exposed surfaces should, as soon as made, be dressed with a wound-covering. The cheapest and most efficient wound-dressing to apply is ordinary coal-tar. It is a combined disinfectant (killing all spores present), wood-preservative (protecting the wood against wood-rotting organisms), and protective covering (having the excellent property of pliability, so that it does not crack when the wood expands or contracts), and may readily be applied with a small paint-brush. Care should be taken to prevent the tar from running on to the healthy bark. Wound-dressings should be renewed annually or until such time as the wounds callus over. This is a necessary precaution, as all large wounds have a tendency to crack and expose wood uncovered with any protective coating.

Spraying is useless for controlling silver-blight, as the mycelium is internal and cannot be reached by sprays. Sulphate of iron, which was at one time freely recommended, has also proved to be ineffective for the treatment of this disease. Moreover, all injections into the tree of substances toxic to the fungus have proved fruitless as a controllant.

LITERATURE CITED.

BINTNER, J.—1919, Silver-leaf Disease, *Bull. Miscell. Information*, Kew, pp. 241–263.

BROOKS, F. T.—1912, Silver-leaf Disease, *Jour. Agr. Sci.*, Vol. 4, pp. 133–144; 1913, *ibid.*, Vol. 5, pp. 288–308.

DUKE OF BEDFORD and PICKERING, S. U.—1910, Silver-leaf Disease, *Woburn Exp. Fruit-farm Rep. 12*, pp. 1–34; 1919, *Science and Fruitgrowing*, London, pp. 231–240.

GUSSOW, H. T.—1911, Preliminary Note on Silver-leaf Disease of Fruit-trees, *Phytopath*, Vol. 1, pp. 177–179.

MASSEE, G.—1910, Silver-leaf, *Diseases of Cultivated Plants and Trees*, London, p. 66.

PERCIVAL, J.—1902, Silver-leaf Disease, *Jour. Linn. Soc.*, Vol. 35, pp. 390–395.

PASTURE TOP-DRESSING EXPERIMENTS AT TE KUITI.

TESTS WITH NAURU ROCK PHOSPHATE.

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A SERIES of fertilizer top-dressing experiments was started in August last on Mr. Charles Harrison's farm at Te Kumi, about two miles from Te Kuiti. Mr. Harrison offered an area of permanent pasture which has been laid down at least eight years, and has had no dressings of artificial fertilizer nor lime for the past five years. When the writer inspected the pasture in August it was composed chiefly of cocksfoot, perennial rye-grass, crested dogstail, a little timothy (especially in the depressions), white clover, and suckling-clover or trefoil. The soil is a light loam with only a moderate amount of humus present. The subsoil is free with good capillary powers, as evidenced by the way it stands dry spells. The land, which as far as can be ascertained was originally in bracken-fern, is undulating and is typical of thousands of acres of similar country in the King-country. It is free in nature, easy to work whether wet or dry, and naturally well drained.

The rainfall is an important factor in the efficiency of slow-acting phosphatic fertilizers. Following is the record for Te Kuiti in 1921, covering the period of the tests here recorded:—

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Rainfall (Inches).												
1·97	2·26	1·86	3·67	2·30	7·16	7·14	4·46	3·51	10·32	4·65	7·50	56·80
Number of Wet Days.												
13	7	9	10	13	17	18	14	13	21	14	17	166

The rainfall in January, 1922, was 2·93 in., with fourteen rainy days. The mean annual rainfall for the last ten years (omitting 1919, which is not available) is 60 in.

A local committee of dairy-farmers, including the owner of the property, Mr. Harrison, is co-operating with the Department in carrying out the trials. The principal of the District High School is on the committee, in addition to the farmers.

The primary object of the tests (which form part of a scheme of top-dressing experiments in different districts of the Auckland Province and other parts of the Dominion) is to determine the value of finely-ground raw rock phosphate for permanent pasture. Phosphate from Nauru Island was used on plots side by side with basic slag, while other plots received high-grade superphosphate

GENERAL VIEW OF THE PLOTS AT TE KUMI.

Showing the middle-line dividing the two rows of nine on each side. Photo taken just after cutting for hay in January.

manufactured in New Zealand from Nauru/Ocean phosphate rock. Control plots receiving no dressing of fertilizer were included as checks. Raw phosphate and superphosphate were also applied to plots which had received dressings of ground limestone immediately previous to the application of those fertilizers.

The dimensions of each plot are 5 chains by two-thirds of a chain, the area being one-third of an acre. The long narrow plot reduces error caused by the varying quality of the soil and other disturbing factors. The eighteen plots, which allowed of each dressing being in triplicate, were arranged in two rows of nine each. Some authorities, after making careful examination of different systems of arranging plots in field experiments, have found that

this arrangement gives the most accurate results. There is a division 3 ft. wide separating individual plots, and a shallow trench made by a plough around each one. This provides to a large extent against the surface washing of fertilizer from one plot to the next. The plots were set out gratuitously by Mr. A. W. Cheal, N.Z.I.S., of Te Kuiti.

The fertilizers were applied on 8th and 9th September last. These dates were late for slowly soluble fertilizers such as raw rock phosphate and basic slag, but this was unavoidable without missing a season, as the offer of the field was only made to the Department in August last.

The field was shut up in October, and cut and weighed as hay in January. The weighing occupied two days, and was completed on 16th January. The following table gives the first season's results after the grass was made into hay, and the yields thus recorded :—

Fertilizer used.	Amount per Acre.	Yield per Acre: Mean Average of Three Plots.			Percentage Yield.	Percentage Increase due to Fertilizer.
		Cwt.	qr.	lb.		
Check	No manure	23	2	20	100·0	..
Basic slag.. ..	3 cwt.	29	0	16	123·0	23·0
Superphosphate ..	3 cwt.	41	0	19	173·8	73·8
Rock phosphate ..	3 cwt.	29	1	3	123·6	23·6
Superphosphate ..	3 cwt.	41	2	17	175·9	75·9
Ground limestone ..	1 ton					
Rock phosphate ..	3 cwt.	27	1	17	115·7	15·7
Ground limestone ..	1 ton					

If the average of the three check plots which received no fertilizer is considered as being free from error, then the natural yield of the pasture is arrived at. Superphosphate gave an increased yield of over 73 per cent. If 10 per cent. is allowed for experimental error for the first season's results, then it still has shown an increase of 63 per cent. over and above the natural yield. Combined with ground limestone it gave 2 per cent. higher. Basic slag gave an increase of 23 per cent. and rock phosphate over 23 per cent. Allowance may be made here for probable error. The slight difference in favour of the rock phosphate may be negligible, but when farmers are anxious to know how rock phosphates compare with a popular and standard fertilizer like slag it becomes more significant and will be taken notice of. The very high increase from superphosphate was to be expected, as the fertilizers were only applied in the spring, and this unduly favoured the quick-acting superphosphate and handicapped the slower slag and rock phosphate. As in the trials at Puwera,* lime used with rock phosphate has decreased the growth.

It is intended to top-dress the plots again during the present month, and cut for hay again next summer. In comparison with superphosphate the slag and raw rock phosphate should produce higher yields next season. It is very satisfactory to know that, if the occasion should arise as predicted, the raw rock phosphate will—as results so far indicate—make a good substitute for high-grade slag,

* See *Journal* for December, 1921, page 364.

which was made by the old Bessemer process, now superseded in England by the newer open-hearth method by which a lower-grade slag is produced, with a low solubility.

It is difficult to put the results of these tests on a money basis, as farmers who save hay usually find it indispensable for their own use if they want to carry their stock through the winter satisfactorily, and do not sell. However, if one assesses it and the fertilizers with "cover" used by insurance companies, then the following table will show comparisons of some interest.

Expenditure on Manures.	Cash Return as Hay.	Gain or Loss.
	£ s. d.	£ s. d.
£1 on basic slag	1 1 9	Gain 0 1 9
£1 on superphosphate	3 11 10	Gain 2 11 10
£1 on rock phosphate	1 4 5	Gain 0 4 5
£1 on superphosphate and lime ..	1 5 9	Gain 0 5 9
£1 on rock phosphate and lime ..	0 5 5	Loss 0 14 7

This season the hay in the stack is assessed by insurance companies at £3 per ton, and the fertilizers at 75 per cent. of the then market price at the time of application for cover. The labour in applying the fertilizers, and other factors, are not taken into account in the table. It will be seen that on the very conservative basis used in these valuations it paid, except in the case of the lime and rock phosphate, to cut for hay. When fed to stock the value of the hay is greatly enhanced, and it is difficult to put a price on it.

The report of the Department's Chemist on the fertilizers and lime used gave the following particulars:—

Fertilizer.	Total Phosphoric Acid (P_2O_5).	Tricalcic Phosphate.
	Per Cent.	Per Cent.
Superphosphate	22·41 (19·4 soluble in water)..	48·92
Ground Nauru phosphate ..	36·49 (8·0 soluble in 2 per cent. citric acid)	79·66
Basic slag	19·5 (15·82 soluble in 2 per cent. citric acid)	42·57

Te Kuiti ground limestone: 91 per cent. carbonate of lime (C_aCO_3).

Wheat and Oats Threshings.—Returns of actual threshings received to 20th April by the Government Statistician from millowners showed that until then 3,266,320 bushels of wheat and 1,544,240 bushels of oats had been threshed out. The average yields per acre in cases where particulars of areas were furnished (covering 99 per cent. of total threshings) worked out at 30·89 bushels for wheat and 37·67 for oats.

Shorthorn Herd-book.—We acknowledge with thanks receipt of a copy of Volume xviii (1922) of the New Zealand Shorthorn Herd-book from the secretary of the Society at Christchurch.

Noxious Weeds.—Gorse has been declared under the Noxious Weeds Act by the Hokianga County Council.

VINE-CULTURE UNDER GLASS.

J. C. WOODFIN, Vine and Wine Instructor, Wellington.

THE purpose of this article is to help beginners by advising in a more or less general way how grapes should be grown. It is not intended to deal with the many variations in method of training, &c., these being merely adaptations of the same principle. A plan for a vinehouse is not included, it being considered that as one plan would have but a very limited application its inclusion would not serve a sufficiently useful purpose. The number of houses planted with grape-vines is constantly increasing. The greater number are small and intended for the production of grapes for home consumption, but there has also been a number of new houses built for commercial purposes, though the cost of building has been high. In many cases the small houses used are not at all suitable, and disappointment results.

Grapes can be, and are, successfully grown in houses of many kinds, and provided certain general principles are observed there is a reasonable prospect of success. In some cases pot-plants are grown in the same house as the vines, but only in rare instances does this make a good combination. If, however, the house is so built that there is a good deal of glass not obscured by the vines the plan may be successful. When this practice is in vogue the pot-plants should be a secondary consideration, and treatment should be given for the vines just as though there were no pot-plants. Small buildings leaning against a dwellinghouse are rarely suitable for vines; usually there is a door opening into the dwelling, and this being left open creates a dry atmosphere. Fairly large houses in similar positions answer very well, as the greater body of air is not much affected by dry air from the dwelling. The vine requires a fairly moist atmosphere and a good border for the roots to work in. Unless these conditions are provided it cannot succeed.

SITUATION.

The vinehouse should be built in a position that will secure the greatest possible amount of sunshine. In some places it is not possible to so place the building that it will get the sun from sunrise to sunset, hills or tall trees being in the way. Where a choice is possible in such cases the early morning sun should have preference to the evening rays. The ventilators should be closed before the sun leaves the roof; the temperature will then rise and a fair degree of warmth be maintained far into the night. It is after midnight that the heaviest fall takes place, and this will occur however late the sun may shine on the house. The earlier warmth can be secured the better, and this is the reason why early morning sun is more valuable than that of the evening. In places where the configuration of the land is such as to give the benefit of both morning and evening sun the fall in temperature will be of short duration. In such places grape-growing is comparatively easy, and early ripening takes place.

DESCRIPTION OF VINEHOUSE.

The span house (or, as some term it, the ridge house) is most economical to build because there is no waste back wall. For an open situation this is the best form. The general dictum is that such a house should run north and south. In this position the sun rises on one side and sets on the other. There is abundant evidence, however, that, at any rate in the warm climate of northern districts, it makes practically no difference which way the house faces, and it may be built in the position which is most convenient. The side walls should not be less than 4 ft. high. A lesser height than this, unless the angle of the roof be sharper than is necessary or advisable, will make the working of the vines very inconvenient. Side walls are frequently built up of solid material, either boards or concrete, though the present tendency is to make them partly of glass. This is much to be preferred, though a little more expensive. Probably the best form is a concrete foundation making a wall 10 in. or 12 in. high, with the remainder glass.

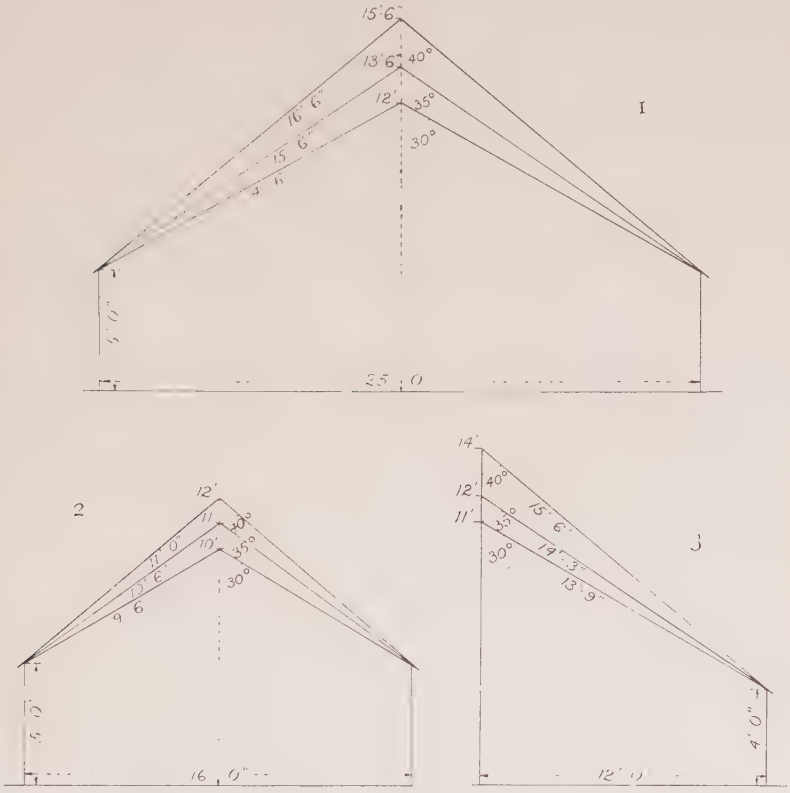
A lean-to house should face north-west, with a little variation one way or the other as surrounding conditions may render advisable according to the factors dealt with under "Situation." The front wall will be the same as for the span house. The lean-to is the best form of house for the production of early grapes, and where artificial heat is employed. In this case the roof should have a pitch of 45°. Except for early houses a pitch of 30° to 40° is ample. The lower the pitch the lower will be the proportionate height of the end walls, and consequently the expense of building. A lower pitch than 30° should be avoided except in a very dry climate. In rainy climates a fair pitch is necessary to secure a proper movement of the air and avoid a stagnant atmosphere, so that 35° or 40° would be better than 30°. The accompanying diagrams explain the application of the different angles mentioned.

Ventilation should be ample, particularly at the top. In the case of span houses ventilators should be placed on each span, and in the case of lean-to houses in the back wall, always as near the apex of the roof as possible.

Size of House.

The size of the house is frequently decided by the means of the owner. When the cost of building is compared with the value of the crop it will produce, it will readily be recognized that a very small house is the one that will give the lowest proportionate return. On the other hand, very large houses are not economical, as the extra strengthening required is costly. I cannot do better than quote a well-known English authority on this matter, as follows: "Probably there are more vineries built 25 ft. or 30 ft. wide for market purposes than any other width, though houses 15 ft. or 16 ft. wide are common, and vines do very well in them. Above 30 ft. wide houses tend to become unwieldy, and the expense of building is considerably increased. Most of our leading nurserymen have at some time or other gone in for building giant houses, but in nearly every case they have returned to the more workable sizes. In the same way the length of a house should not exceed 200 ft., as excessive length creates difficulties in the keeping-up of uniform temperatures in all parts of the house, and

also in ventilation, and even the working of ventilators themselves. In Worthing the favourite size seems to be 160 ft. long by 25 ft. or 30 ft. wide. In the north of London the houses run somewhat longer, especially in the big nurseries, 200 ft. being common. From all points of view the most workable size is the Worthing standard."



SECTIONS OF VINEHOUSES, SHOWING PITCH OF ROOF, ETC.

Fig. 1. Span-roofed house, 25 ft. wide, showing height at centre, and length of rafter at angles (from the horizontal) of 30°, 35°, and 40° respectively. If the side walls are built 4 ft. instead of 5 ft. high, as is commonly done, the height at centre will be 12 in. less.

Fig. 2. Span-roofed house, 16 ft. wide, with side walls 5 ft. high, showing height in centre, and length of rafter at angles of 30°, 35°, and 40°.

Fig. 3. Lean-to house with front wall 4 ft. high, showing height of back wall, and length of rafter with roof pitched at 30°, 35°, and 40°. Note.—It is often convenient to gain head-room by lowering the floor, thus saving in height of wall.

The Trellis.

Wires for training and support of the vines are preferably fixed longitudinally in the house, No. 12 galvanized wire answering this purpose. Long screw-eyes should be fixed to each rafter, these being long enough to keep the vine-rods 18 in. from the glass. Light angle-

irons with the necessary holes drilled to take the wires should be fixed at either end of the house and the wires tightly strained. The wires may be about 18 in. apart. One of the most frequent mistakes is training the rods too close to the glass. The leaves and sub-laterals occupy the space between the rods and the glass, and if there is not plenty of room the leaves press against the glass. Moisture that collects during the night is not then readily dispelled, and remains until evaporated by hot sunshine. The result is scalded leaves and frequently attacks of mildew. There should be a clear space between the leaves and the glass. There will then be a free current of air passing between them, so that moisture is quickly dispelled and the leaves can function properly. Good grapes cannot be got unless there are good leaves.

There is, however, much diversity of opinion among good authorities as to the best form of trellis. Some prefer to have the wires running horizontally along the house, while others arrange them vertically in the same direction as the rafters. As to the spacing of wires, most authorities advise that they should be 9 in. apart. It will readily be seen that where the wires are fixed at this distance, whether they run up and down or along the house, tying down the laterals is an easy matter, as the wires are sure to be in the right position. Of course, fixing wires so closely means a considerable expense, proportionate to the size of the house. Not only has the additional wire to be found and stretched, but extra screw-eyes or other supports must also be provided. If the wires are fixed 9 in. apart, or anywhere near that distance, then they should certainly be fixed vertically, as otherwise painting or cleaning would be a very difficult undertaking.

In this country comparatively few are inclined, or can afford, to erect a costly trellis, even though it may be the most convenient for working. As a matter of fact, more or less makeshift trellises are general at present and seem likely to prevail in future, and, all things considered, it probably is better so. When only sufficient wires to support the weight of the crop are permanently fixed, and these run lengthwise through the house, strands of raffia or flax are easily run up to tie the laterals to. These strands should be tied to the top and bottom wires only, being merely twisted over the intervening wires. When the laterals are cut away the temporary strands are then easily removed, and the roof is left open for cleaning or painting.

THE BORDER.

In all but the most recent standard works on gardening the directions for making a vine-border are of a very elaborate character, involving the removal of the existing soil from the site and replacing with fresh material of various kinds. It should be understood that this practice was recommended at a time when grapes were sold at very high prices, or when intended for private consumption. Such owners were usually possessed of large means, and even these people sold part of the crop, often for as much as a guinea a pound. When the price dropped, say, to 7s. 6d. per pound the methods referred to no longer paid. These conditions passed, competition did away with fancy prices, and methods of production had to be revised.

The elaborately made border is now a thing of the past so far as commercial undertakings are concerned. The cost of labour is very much greater than it was only a very few years ago, and this, together with the lower prices obtainable for the fruit, forbids the making of expensive borders. The necessity of the case has proved that expensive made borders are not essential, and that vines do well in many classes of soil. The soil used should be of such a character that the roots are able to work freely in it; it should be of fair depth, and be well drained. If good drainage is natural, so much the better; if not, it must be provided. Spouting should be fixed to catch rain falling on the roof. This is not of great consequence during summertime, but in winter, when the greatest amount of rain falls, if there is no spouting the soil close to the building becomes sodden, cold, and stagnant, and cases are known where the roots have been killed, and the vines have died from this cause. Water from the spouting should be led into the drains, or at least to a position where it can get away from the border.

In some cases private vineries are built or houses are planted with vines where the soil is unsuitable for grape-growing, in some cases being very little but hungry clay. A made border is necessary in such cases to obtain satisfactory results, the best material being the top spit from an old pasture. The site should be excavated to a depth of at least 30 in. If drainage is necessary the pipes should be placed 6 in. deeper at the foot of the border. The method of filling is to cut the turfs about 3 in. thick, placing them as cut with the grass side down. When a layer of the turfs has been placed, cover with a layer of loose crumbs of the same soil, which will close up interstices. On this apply a dressing of carbonate of lime about $\frac{1}{2}$ in. deep, together with bone-meal at the rate of 2 oz. per square yard. Continue in this way until the space is filled, finishing with about 6 in. of loose soil into which the same amount of lime and bone-meal should be worked.

For commercial purposes the house should be built where the soil is of a suitable character. Trench to a depth of 30 in. at least, 36 in. being better. Arrange the trenching so as to leave the top soil still on top. Give lime and bonemeal as with the made border, to a total amount of $\frac{1}{2}$ lb. of bone-meal per square yard, to be mixed with the soil as trenching proceeds. Assuming soil and other conditions to be suitable, the best site for the house is on an old pasture. Where the outside border is level with the floor of the house it is better to plant the vines inside the house, in which case the border should extend to about 2 ft. inside the walls. The roots always go outside to the sun when they can do so; therefore all that is required inside is just sufficient border room for planting. In cases where the roots are to grow inside the house—this being preferred where the vines are forced, as watering is under control and the soil is warmer—the whole of the space should be trenched in the same way as recommended for outside borders. In some cases the site chosen may be low or the subsoil wet. It is then advisable to cart soil to raise the borders. On slopes it may be necessary to lay drains to cut off water that would reach the borders by seepage. It should always be borne in mind that a sweet rooting-medium is of vital importance. A dry border can be watered; if it becomes too wet remedial measures should be resorted to.

INSECT NOTES: 1921-22 SEASON.

DAVID MILLER, F.E.S., Entomologist, Biological Laboratory.

THE following matter deals with the more outstanding injurious insects which have come under notice during the 1921–22 season. It is worthy of note that the records deal with insects mostly of the North Island and from the South Island as far south as South Canterbury. The species recorded are arranged under several heads according to their habitat, but the forest insects have been omitted, since they are being dealt with in a special work on forest entomology.

FRUIT INSECTS.

Lemon-tree borer (*Aemona hirta*): The larva of this beetle bores in several plants, and does considerable damage to gooseberry-bushes and lemon-trees.

Aspidiotus epidendri was found infesting palms at Hastings.

Greedy scale (*Aspidiotus rapax*) found on various plants.

Rose scale (*Aulacaspis rosae*), attacking loganberries and raspberries.

Red mite (*Bryobia pratensis*): This mite is very abundant upon apple-trees, and a special investigation is being carried out with regard to it. During the past season, however, the red mite has not been at all plentiful owing to the wet conditions in the spring.

Soft scale (*Coccus hesperidum*), attacking branches and twigs of the Northern Spy apple.

Oblique tortrix (*Ctenopseustis obliquana*) is prevalent upon the foliage of apple and grape-vine. In both cases the caterpillars not only roll up and eat the leaves, but also attack the fruit.

The magpie-moth (*Deilemera annulata*) is one of the commonest moths in New Zealand; it is recognized by the black wings with white spots and the yellow bands on the body. The black, hairy caterpillars have frequently been sent in as infesting fruit-trees, but there is nothing definite to show that they are injurious.

Walnut leaf-mite (*Eriophyses tristriatus*) infests the leaves of the walnut, specimens having been received from Dunedin and Christchurch.

The ghost-moth (*Charagia virescens*) is the largest of our native moths; its caterpillars are wood-borers, and attack many native and some exotic trees. In the orchard it has been found boring in nectarine-trees.

The omnivorous case-moth (*Oecetieus omnivorus*), although, as its name implies, feeding on a variety of foliage, may at times occasion some damage to the foliage of fruit-trees by eating out large holes. It is a conspicuous object, and is recognized by the cigar-like case to which fragments of twigs and leaves are attached. In this the larva lives, its head projecting, when feeding, from the broad end.

Pear-leaf-rolling midge (*Perrisia pyri*) has already been dealt with in detail in an article published in the *Journal*. During the past season, however, this insect has made its appearance in the Tasman and Motueka districts.

Citrus red spider (*Schizotetranychus mytilaspidis*) was found infesting lemon-trees at Gisborne.

Other insects dealt with include the codlin-moth (*Cydia pomonella*), apple leaf-hopper (*Typhlocyba australis*), pear and cherry slug (*Eriocampoides limacina*), and numerous species of scale insects, &c., all of which are commonly met with in orchards.

FIELD-CROP AND GARDEN INSECTS.

Greasy cut-worm (*Agrotis ypsilon*) has been prevalent, as usual, during the past season, attacking rape and root crops, particularly mangolds.

Clover-seed chalcid (*Brucophagus funebris*) was present in large numbers in clover-seed growing at Blenheim.

Olearia gall-midge (*Cecidomyia oleariae*) is very common in most parts of the Dominion. The adults emerge in the early spring, and the females deposit masses of bright-red eggs upon the young shoots.

Cockle eelworm (*Tylenchus tritici*) was prevalent in wheat from Canterbury, forming the characteristic black "ear-cockles."

Conspicuous melanchra (*Melanchra insignis*): The caterpillars of this native moth may cause some damage to bulbous plants, attacking the flowers and leaves.

Chafer beetles: The most prominent species dealt with are the brown chafer (*Odontria zealandica*), the small green chafer (*Pyronota festiva*), and the large green chafer (*Stethaspis suturalis*). Although the last is at times injurious to the roots of garden and field plants, the other two are widespread in their depredations. The adult brown chafer also attacks the foliage of fruit-trees.

Bronze moth (*Plusia chalcites*): This insect is a native species, but its green looping caterpillars feed on a variety of plants, and may be found upon maize and other cereals. At Harakiki, near Motueka, these caterpillars did some considerable damage to the foliage of tobacco-plants.

Subterranean grass-caterpillars (*Porina* spp.): These caterpillars cause considerable localized damage to pasture and lawns every season, particularly in the North Island. In the vicinity of Te Namu, in Westland, an extensive area of coastal pasture was destroyed last spring.

Sphinx moth (*Sphinx convolvuli*) is a very rare moth in New Zealand. It occurs in the Auckland District, where its caterpillars feed upon the foliage of the kumara. A specimen was recently captured at Wellington.

Onion-mite (*Rhizoglyphus echinopus*), introduced from Europe, occurs on onions, specimens having been received from Christchurch.

Blue oat-mite (*Notophallus bicolor*) did considerable damage to crops of Algerian oats in South Canterbury. It is an Australian species.

INSECT NOTES: 1921-22 SEASON.

DAVID MILLER, F.E.S., Entomologist, Biological Laboratory.

THE following matter deals with the more outstanding injurious insects which have come under notice during the 1921–22 season. It is worthy of note that the records deal with insects mostly of the North Island and from the South Island as far south as South Canterbury. The species recorded are arranged under several heads according to their habitat, but the forest insects have been omitted, since they are being dealt with in a special work on forest entomology.

FRUIT INSECTS.

Lemon-tree borer (*Aemona hirta*): The larva of this beetle bores in several plants, and does considerable damage to gooseberry-bushes and lemon-trees.

Aspidiotus epidendri was found infesting palms at Hastings.

Greedy scale (*Aspidiotus rapax*) found on various plants.

Rose scale (*Aulacaspis rosae*), attacking loganberries and raspberries.

Red mite (*Bryobia pratensis*): This mite is very abundant upon apple-trees, and a special investigation is being carried out with regard to it. During the past season, however, the red mite has not been at all plentiful owing to the wet conditions in the spring.

Soft scale (*Coccus hesperidum*), attacking branches and twigs of the Northern Spy apple.

Oblique tortrix (*Ctenopseustis obliquana*) is prevalent upon the foliage of apple and grape-vine. In both cases the caterpillars not only roll up and eat the leaves, but also attack the fruit.

The magpie-moth (*Deilemera annulata*) is one of the commonest moths in New Zealand; it is recognized by the black wings with white spots and the yellow bands on the body. The black, hairy caterpillars have frequently been sent in as infesting fruit-trees, but there is nothing definite to show that they are injurious.

Walnut leaf-mite (*Eriophyses tristriatus*) infests the leaves of the walnut, specimens having been received from Dunedin and Christchurch.

The ghost-moth (*Charagia virescens*) is the largest of our native moths; its caterpillars are wood-borers, and attack many native and some exotic trees. In the orchard it has been found boring in nectarine-trees.

The omnivorous case-moth (*Oeceticus omnivorus*), although, as its name implies, feeding on a variety of foliage, may at times occasion some damage to the foliage of fruit-trees by eating out large holes. It is a conspicuous object, and is recognized by the cigar-like case to which fragments of twigs and leaves are attached. In this the larva lives, its head projecting, when feeding, from the broad end.

Pear-leaf-rolling midge (*Perrisia pyri*) has already been dealt with in detail in an article published in the *Journal*. During the past season, however, this insect has made its appearance in the Tasman and Motueka districts.

Citrus red spider (*Schizotetranychus mytilaspidis*) was found infesting lemon-trees at Gisborne.

Other insects dealt with include the codlin-moth (*Cydia pomonella*), apple leaf-hopper (*Typhlocyba australis*), pear and cherry slug (*Eriocampoides limacina*), and numerous species of scale insects, &c., all of which are commonly met with in orchards.

FIELD-CROP AND GARDEN INSECTS.

Greasy cut-worm (*Agrotis ypsilon*) has been prevalent, as usual, during the past season, attacking rape and root crops, particularly mangolds.

Clover-seed chalcid (*Brucophagus funebris*) was present in large numbers in clover-seed growing at Blenheim.

Olearia gall-midge (*Cecidomyia oleariae*) is very common in most parts of the Dominion. The adults emerge in the early spring, and the females deposit masses of bright-red eggs upon the young shoots.

Cockle eelworm (*Tylenchus tritici*) was prevalent in wheat from Canterbury, forming the characteristic black "ear-cockles."

Conspicuous melanchra (*Melanchra insignis*): The caterpillars of this native moth may cause some damage to bulbous plants, attacking the flowers and leaves.

Chafer beetles: The most prominent species dealt with are the brown chafer (*Odontria zealandica*), the small green chafer (*Pyronota festiva*), and the large green chafer (*Stethaspis suturalis*). Although the last is at times injurious to the roots of garden and field plants, the other two are widespread in their depredations. The adult brown chafer also attacks the foliage of fruit-trees.

Bronze moth (*Plusia chalcites*): This insect is a native species, but its green looping caterpillars feed on a variety of plants, and may be found upon maize and other cereals. At Harakiki, near Motueka, these caterpillars did some considerable damage to the foliage of tobacco-plants.

Subterranean grass-caterpillars (*Porina* spp.): These caterpillars cause considerable localized damage to pasture and lawns every season, particularly in the North Island. In the vicinity of Te Namu, in Westland, an extensive area of coastal pasture was destroyed last spring.

Sphinx moth (*Sphinx convolvuli*) is a very rare moth in New Zealand. It occurs in the Auckland District, where its caterpillars feed upon the foliage of the kumara. A specimen was recently captured at Wellington.

Onion-mite (*Rhizoglyphus echinopus*), introduced from Europe, occurs on onions, specimens having been received from Christchurch.

Blue oat-mite (*Notophallus bicolor*) did considerable damage to crops of Algerian oats in South Canterbury. It is an Australian species.

Clover-aphis (*Aphis bakeri*) is a North American species, and frequently occurs in clover-seed in New Zealand. Through the agency of the honeydew exuded by the insect the seed is glued together in lumps of varying size.

During the past year there have been the usual seasonal localized outbreaks of the army-worms (*Cirphis unipuncta* and *Melanchra composita*). There have been frequent complaints of damage to garden crops by millipedes and collembola.

LIVE-STOCK INSECTS.

Sheep maggot-flies: The investigation of these insects is still being carried on, and the results will be published in a special article. Specimens of maggoty wool infested by the Australian golden-haired blow-fly (*Pollenia stygia*) and the European greenbottle (*Lucilia sericata*) were constantly being sent in throughout the season.

Horse bot-flies: Two species of these flies—*Gastrophilus intestinalis* and *G. nasalis*—occur in New Zealand. Both are of European origin.

Sheep nasal bot-fly (*Oestrus ovis*) occurs in most parts of New Zealand, even on the higher levels.

Other species of the year are the sheep-ked (*Melophogus ovinus*), the cattle-tick (*Haemaphysalis bispinosa*), and the several species of sheep and cattle lice.

HOUSEHOLD AND STORED-PRODUCT INSECTS.

A native species of carrion beetle (*Necrobia rufipes*) was found in a tin of dried milk. The common woodlouse (*Porcellio scaber*) sometimes infests dwellings and eats the scrim from the back of wall-paper, which it also punctures. The grain-weevils (*Calandra granaria* and *C. oryzae*), and the Angoumois grain-moth (*Sitotroga cerealella*) are well established in the Dominion; while the flour-moth (*Ephestia kuhniella*) is of very general occurrence. *Ptinus fur* is also frequently met with in grain-stores; it was particularly noticeable this year at Christchurch. *Carpophilus aterrimus* often infests dried fruits. The cigarette-beetle (*Lasioderma sericorne*), the saw-toothed beetle (*Silvanus surinamensis*), and *Ptinus fur* were bred from dates.

INSECTS INTERCEPTED IN QUARANTINE.

From material imported from the undermentioned countries, and sent in by the port quarantine inspectors, the following insects have been bred out:—

Australia: Mediterranean fruit-fly (*Ceratitis capitata*) and *Dacus passiflorae*, on oranges from Sydney; tomato-fly (*Lonchaea splendida*) and red scale (*Chrysomphalus aurantii*), on oranges from Melbourne; *Dermestes vulpinus*, on fox-skins.

China: *Carpophilus aterrimus* in water-chestnuts; peanut-moth and walnut-moth (*Plodia interpunctella*), on peanuts and walnuts.

England: Goat-louse (*Linognathus stenopsis*), on young goat.

Fiji: Coconut-fly.

Holland: Bulb-mite (*Rhizoglyphus* sp.), *Merodon equestris*, and *Muscina stabulans*, on hyacinth-bulbs.

Country unspecified: Psyllid (*Rhinocola* sp.), on boronias.

THE ERECTION AND CLEANING OF MILKING-MACHINES.

[The following instructions and advice have been issued by the Director of the Dairy Division, Mr. W. M. Singleton, in the form of a wall-card for handy reference by d iry-farmers, and distributed through the dairy factories. In order to give this important matter further publicity the instructions are here reprinted.]

ERECTION.

1. ALL piping, whether for the vacuum or releaser system, should be of the best drawn brass, tinned, and either in full or in shorter lengths joined together over each bail-partition with well-faced-up unions rather than with rubber sleeves or socket joints. When necessary to prevent vibration a rubber sleeve could be used next to vacuum-pump.

2. The piping should be supported on removable top brackets every 3 ft. to 4 ft. to prevent sagging, and should have a perceptible fall toward releaser or vacuum-tank.

3. The vacuum-pump, vacuum-tank, and releaser should be so installed that all pipe-lines may be straight. The vacuum-pump, the releaser, and the vacuum-pipe to the milking-shed should, if possible, each have an independent and straight connection to the vacuum-tank. Where the straight line cannot be followed as between the pump and the vacuum-tank, crosses with plugs must be used. Bends or right angles must not be used.

4. The body of the vacuum-tank must be in two parts, or the cover must be of a diameter equal to that of the top of the tank. All unions connecting the vacuum-tank to pipes must be close to vacuum-tank, to facilitate its removal for cleaning. If all three pipes connected to this tank be in a straight line, a brush can be passed along each system to the tank as found necessary. The previous remarks regarding piping and unions are also relevant to the pipe from the vacuum-pump to the vacuum-tank. At or within 3 in. of the end of the vacuum-pipe farthest from the pump a suitable hose-tap must be provided. This tap and a cap or plug for the end of the pipe will make cleaning possible.

5. The releaser and vacuum-tank, where the vacuum-tank system is in use, should be placed outside the milking-shed and coupled together with short removable connections. This system of erection is suitable for either whole-milk or cream supply, as, should home separation be considered desirable, a separator-room could be built, preferably detached from main building, necessitating only an extra length each of milk and vacuum piping. Under no conditions should the releaser and separator be placed in the engine-room. A passage-way between the engine and separator-room is essential.

6. In the erection of milking plants care should be taken to see that the exhaust from engine and pump is so placed that danger of

contamination of milk or cream is avoided. The exhaust from the engine and vacuum-pump should be carried outside and well away from the milk-stand or separator-room.

7. Under the system of whole-milk supply, and where circumstances warrant, it is quite feasible to have the releaser erected at opposite end of building to engine and pump-room. This entails no increase in piping (giving straight pipe-lines) or labour in cleaning.

8. A suitable plant for boiling water must, if not already provided by the owner, be included as part of every milking plant sold and erected.

9. The Dairy Industry Act provides the necessary authority for Dairy Instructors to require to be remedied to their satisfaction any defect which causes a milking-machine to be unfit for its purpose. It is wise, therefore, that both agent and dairy-farmer connected with the installation of a milking-machine should see that the erection is carried out on approved lines.

CLEANING.

1. Before milking, draw cold water through all milk-tubes and releaser, thus preventing adhesion of milk to pipes.

2. Immediately after each milking wash all dirt off the outside of the teat-cups, and then draw cold water through teat-cups and releaser, followed by hot water with washing-soda or other cleanser added. Complete the operation by using plenty of boiling water. The teat-cups and rubber parts should then be removed and placed in a clean can for protection from dust.

3. For releaser-pipe insert a ball of horsehair, and have same drawn twice after each milking through releaser-pipe into releaser; at the same time draw hot water with soda added through teat-cups nearest end of pipe-line. Complete the operation with boiling water.

4. The uptake milk-pipe to the releaser-pipe and all metal claws should be brushed out with a suitable brush daily, the end of the pipe being kept in a solution of hot soda-water while the brush is pulled to and fro. Rinse out with cold water afterwards.

5. The releaser should be taken down daily and cleaned, rubber washer on valve receiving special attention.

6. Flush out vacuum-pipe and tank daily with a solution of boiling water and soda. It is important to clean the pipe between releaser and vacuum-tank in a similar manner. To do this flood releaser, and water will travel to vacuum-tank.

7. After each evening milking remove top or bottom of vacuum tank to allow of thorough airing, and after each morning milking remove vacuum-tank, wash it, and place in a sunny position free from bad odours.

8. Once weekly immerse all rubber parts in cold water to which has been added one teaspoonful of caustic soda to 2 gallons of water, and bring to the boil, after which place in cold water. Do not prolong the boiling, as it may soften the rubbers.

9. Remember that milking-machines cannot be properly cleaned without soda or other cleanser and a plentiful supply of *boiling* water. Neglect to thoroughly clean a milking-machine means impure milk.

Don'ts.—Don't use kerosene-tins to carry away milk. Don't use luke-warm water where hot or boiling is specified. Don't use a cloth for washing any dairy utensil; use a brush.

The cleaning of milking-machines as described has been indicated by the Dairy Instructors—suggested as the result of their experience in assisting dairymen who have installed these machines.

SEED-TESTING NOTES.

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PERENNIAL RYE-GRASS.

PERENNIAL rye-grass (*Lolium perenne*) is one of the most valuable and popular grasses used in New Zealand. Relative cheapness of the seed has added to its popularity, and a large quantity is handled. In addition to that used locally, several hundred tons are exported annually. Britain is the principal buyer of our seed, and that grown in the southern districts is in the main used for export. Practically all the perennial rye-grass used in New Zealand is of local origin, the quantity imported being very small.

The bulk of the rye-grass seed is produced in Poverty Bay, Hawke's Bay, Sandon (in the Manawatu), Canterbury, Otago, and Southland. These districts produce five types of seed, known respectively as Poverty Bay (P.B.), Hawke's Bay (H.B.), Sandon, Canterbury, and Southern. The finest and heaviest seed is produced from old pasture in Poverty Bay and Hawke's Bay, and in consequence commands the highest prices. Sandon seed is usually very popular, and in most seasons is sold for only 1d. or ½d. per pound less than H.B. or P.B. Canterbury seed and Southern seed, with a bushel weight of over 28 lb., is also of excellent quality; but North Island farmers are usually not inclined in its favour, as considerable quantities of it are harvested from comparatively young pasture, and it is maintained that such seed will not hold on North Island soils. At times one hears of the likelihood of Southern seed containing Californian thistle, but in several years only five such occurrences have come under notice at this Laboratory. Small quantities of excellent seed are grown in Maniototo, Central Otago, and sold as Maniototo rye-grass. It is in every way equal to the best H.B. or P.B. seed, and it is a pity that there is not more of it on the market.

Germination.—Perennial rye-grass is a high-germinating seed, and a line of first-class quality should show not less than 90 per cent. germination, while 80 to 89 per cent. may be classed as "good average." The seed is vigorous in germination, and a first-class line will show up to 90 per cent. in three days—that is, when grown under ideal conditions in a seed-germinator.

The greater part of the new season's perennial rye-grass seed has now been tested for germination at this Laboratory. The following

table shows the average germination compared with that for the same period (February, March, and April) of last year :—

District.	Season 1921.				Season 1922.			
	Number of Samples.	Average.	Maximum.	Minimum.	Number of Samples.	Average.	Maximum.	Minimum.
		Per Cent.	Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.
Poverty Bay and Hawke's Bay	16	91	99	79	33	94	99	82
Sandon	73	90	99	49	72	74	96	37
Canterbury	56	83	98	25	72	85	94	57
Southern	68	88	97	29	96	76	95	31
Dominion	281	79	99	18	362	75	99	14

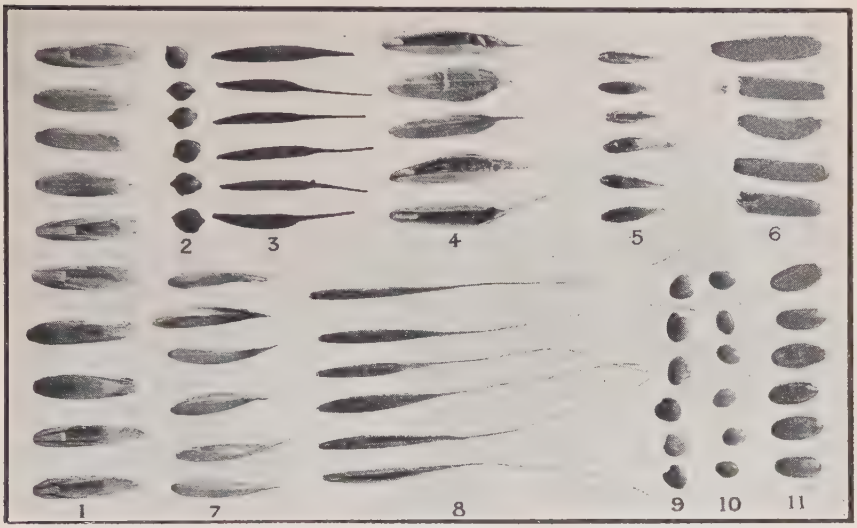
NOTES.—The Dominion figures include all the samples forwarded from the districts specified, together with the seed of which the origin is unknown. The Poverty Bay and Hawke's Bay figures are combined on account of there being a very small number of samples from the first-named district.

In the above figures the fall in the average germination of the seed from the Sandon and Southern districts is particularly noticeable, this being mainly due to an unfavourable harvesting season, with light seed. On the other hand, Canterbury and Hawke's Bay seed is well up to standard. It is, of course, probable that the Sandon and Southern averages have suffered a little by reason of the larger number of samples forwarded for test as compared with the number of samples of Hawke's Bay seed.

Bushel Weight.—Rye-grass should not weigh less than 25–26 lb. to the bushel, and it is generally conceded that the higher the bushel weight the more valuable is the seed. Instances have been met with where rye-grass has weighed up to 40 lb. to the bushel, but this, of course, is exceptional. In general, the North Island seed has a higher bushel weight than the South Island, but in considering rye-grass as a whole it has to be remembered that far the greater quantity is of South Island origin. Bushel weight is an indication of the value of a line of new season's seed, as a low weight shows that it contains a large amount of empty chaffy seed incapable of germination. This rule cannot be applied to all seed, as old lines with a satisfactory bushel weight will show a low germination capacity on account of the large percentage of dead seed contained therein.

Purity.—Thoroughly machine-dressed rye-grass rarely contains more than 2 per cent. (by weight) of extraneous seeds, and in the majority of cases the amount is considerably under 1 per cent. The average percentage for over two hundred samples tested works out at 0·7 per cent. During the twelve months April, 1921, to March, 1922, the 296 samples of rye-grass tested for purity contained forty-nine different kinds of extraneous seeds. The names and frequency of occurrence of the principal extraneous seeds in these samples are as follows : Hair-grass in 217 samples, goose-grass 210, catsear 96, sorrel 83, crested dogstail 78, rib-grass 78, suckling-clover 72, cocksfoot 65, white clover 62, ergot sclerotia 59, Yorkshire fog 51, sweet vernal 37, wild turnip 25, Italian rye-grass 24, cow-grass 14, curled dock 13, alsike 11, oats 11, hawkbit 10, English trefoil 10.

There are no absolutely reliable source-indicators among the impurities found in rye-grass, as three of the most common—goose-grass, hair-grass, and sorrel—are found also in imported seed. The presence of suckling-clover and catsear may be taken as being more or less indicative of New Zealand seed. The presence of ergot (*Claviceps purpurea*) is generally looked upon as harmful, and certain countries prohibit the entrance of seed containing the resting bodies of this fungus. It is often prevalent in New Zealand rye-grass, and apart from its possible ill effects on stock a farmer would be well advised to avoid lines containing an excess of ergot, as apparently sound seeds show its presence when the glumes are removed.



PERENNIAL RYE-GRASS SEED AND SOME OF ITS MAIN IMPURITIES.

(1) Perennial rye-grass; (2) sorrel; (3) catsear; (4) goose-grass; (5) crested dogstail; (6) ergot sclerotia; (7) cocksfoot; (8) hair-grass; (9) white clover; (10) suckling-clover; (11) rib-grass.

Adulteration.—In New Zealand rye-grass is rarely if ever adulterated with foreign seeds, the probable reason being that the only seeds—for example, meadow-fescue—which could be used for this purpose are in all cases more expensive than rye-grass itself. The only practice which comes near to adulteration is that of mixing low- and high-germinating seed together. From a superficial examination this is difficult to detect, a germination test being the only sure method.

Meat-producers Board.—Mr. John Fraser has been appointed General Manager and Mr. T. R. Lees Secretary of the Board.

Store for Dairy-produce.—The buildings in the occupation of the Co-operative Dairy Producers' Freezing Company (Limited) at Wellington have been recently appointed as a store for the storage, cooling, or freezing of dairy-produce prior to export.

FARMERS' SCHOOL AT WERAROA.

A FIRST annual school for farmers at the Department's Central Development Farm, Weraroa, was held during the week 24th to 29th April, and was attended by seventy-nine farmers, mainly from different parts of the Wellington Provincial District. The farmers were accommodated in the hutment quarters occupied previously by returned-soldier trainees, and a large room in one of the homestead buildings was utilized as a lecture-hall. The general management of the school was in the hands of Mr. W. J. McCulloch, Manager of the Central Development Farm, while Mr. A. H. Cockayne, Biologist, and Mr. F. W. Greenwood, Instructor in Agriculture, were associated in the organization. The school was formally opened by Dr. C. J. Reakes, Director-General of Agriculture, many visitors being present.

GROUP OF FARMERS AND STAFF AT THE WERAROA SCHOOL.

Lectures and demonstrations by departmental officers comprised the following, the items being given in the order of the week's time-table: Herd-testing (S. Clayton); the feeding of dairy cows (A. H. Cockayne); draught horses (W. T. Collins); ensilage-making (W. J. McCulloch); farm pastures (A. H. Cockayne); lime and liming (F. W. Greenwood); the grasslands of New Zealand (E. B. Levy); summer and winter feeds for dairy cows (A. H. Cockayne); ploughing (W. J. McCulloch); principles of pasture establishment (E. B. Levy); the cow in health and disease (W. T. Collins); swine husbandry (K. W. Gorringe); farm insects (D. Miller); manures and manuring (F. W. Greenwood); poultry-breeding (F. C. Brown); lucerne (F. W. Greenwood); tree-planting (P. M. Page); wool-handling (J. G. Cook); the care of milk (A. A. McKenzie); root and forage crops (W. J. McCulloch and A. H. Cockayne); field competitions, and boys' and girls' agricultural clubs (J. W. Deem).

UPPER PHOTO.—A VETERINARY LECTURE ON THE COW. BELOW.—AT A PLOUGHING DEMONSTRATION.

Breeds of dairy cows were demonstrated by Messrs. Banks (Friesian), Morgan (Milking Shorthorn), Lancaster (Jersey), and McCulloch (Red Poll). A tour of points of agricultural interest in the Levin district was also included in the programme, local farmers and Levin residents kindly provided cars for the purpose. The social side of the school was featured on the night preceding the break-up by an entertainment in the lecture-hall, presided over by the Mayor of Levin, Mr. D. Matheson, and followed by a supper given by the farmers at their quarters. Altogether the school can be recorded as a pronounced success.

KILLING WEEDS ON PATHS AND LAWNS.

For paths the method of treatment depends on the nature of the weeds and the character of the rooting-medium. A weed-killer of sufficient strength to destroy weeds growing on a hard, dry surface of barren clay may be quite ineffectual when applied to perennial weeds growing in good soil, which latter condition often occurs, where the only preparation for a path is the addition of a covering of gravel. Cases are known where a comparatively weak solution has been sufficient to clean paths, and to keep them clean for a year or more. We have, however, had personal experience of cases where very much stronger solutions had to be several times repeated to kill the roots of sorrel and couch-grass. The strength required must vary according to circumstances and is a matter for experiment.

Proprietary weed-killers: There are several of these preparations that have proved to be very effective. They have the advantage of requiring only the admixture of water, and any one who would rather use them than go to the trouble of making their own may do so with confidence.

Arsenic and soda: Mix 1 lb. of arsenic to a paste with a little water, and add this to 2 gallons of water in a kerosene-tin. Place on a fire, preferably in the open air, and when the liquid boils add 2 lb. of washing-soda, keeping the mixture well stirred till the arsenic and soda are completely dissolved. Make up to 20 gallons or to 40 gallons according to the nature of the weeds to be destroyed.

Arsenic and caustic soda: Place 1 lb. of arsenic and 2 lb. of caustic soda in a kerosene-tin nearly full of cold water. The heat generated by the caustic soda will dissolve the arsenic in a few days. Dilute as for arsenic and soda.

Oil of vitriol: Mix in a 3-gallon watering-can 20 pints of water and 1 lb. of the oil.

It should be understood that the arsenic-and-soda mixture is a deadly poison, and the greatest possible care must be taken to keep children or stock from it. The vessels used in its preparation should be distinctly marked to prevent mistakes, as no amount of washing will remove all the poison; they should never be used for watering animals. It has been asked where arsenic for this purpose can be obtained, and at what price. Wholesale chemists can supply arsenic at about 1s. 3d. for a single pound, with reduced rates for larger quantities. Vitriol is very caustic, and it will burn the hands or any clothing it may come in contact with. In the boiling process take care that the liquid does not boil over, as it is inclined to do so. Keep some cold water handy, and if the liquid rises throw in a little cold water; a very little will cause it to sink at once.

Where there are grass or box edgings to a path a board should be inclined against these to prevent the liquid bespattering them. If the weeds have perennial roots the amount of poison it will be necessary to use will of a certainty kill the box-plants.

Lawns.—Add 1½ lb. of sulphate of iron to 1 gallon of water. Apply with a watering-can through a fine rose, or with a spray-pump. This quantity is sufficient for 20 square yards. It will kill soft weeds, such as daisies, and it will brown the grass but will not injure it.

—*Horticulture Division.*

WORK FOR THE COMING MONTH.

THE ORCHARD.

EXPORT NOTES.

SINCE the last record in the April *Journal* an additional 38,675 packages of fruit have been exported (1,500 of these being shipped to South America, 1,030 to Hawaii, and the rest to Britain), making an aggregate this season, to date of writing, of 106,200 packages. The last shipment, per s.s. "Zealandic," left a good deal to be desired in the way of improvement in wiring the cases, quite a large proportion of those seen on the Wellington wharf showing very loose wires. Most of those noticed as being slack had been wired with the old machine. Apparently some improvement could be effected by tapping the wire all round the case when the strain is being applied. This would assist the tightening process by making the wire take the shape of the case. One line of fruit was noticed (wired with the old machine) in which the knot was tied on the corner of the case. This was not nearly so effective as the shipper possibly considered it would be. The knot being on the corner had apparently received considerably more knocking about than it should have, with the result that extra strain had been put on the wire, which, together with the knot slipping and the wire stretching, had caused considerable slackness. The best place for the knot or hitch to be tied is about the middle of the lid, where it helps to even up the bulge. The position of the wire should be about 1½ in. from the end of the case. Another matter requiring attention is the handling of the packed fruit when loading and unloading. All the painstaking care of the grower and packer is somewhat nullified unless those handling the fruit are made to realize the perishable nature of the article entrusted to their care. Unfortunately, this phase of our fruit-export trade, at present, seems to be lost on a large number of those through whose hands the fruit has to pass.

PACKING FOR THE LOCAL MARKET.

A palpable instance of false packing was brought under the notice of the Department recently—a grower having filled a line of cases with withered, spotted, unsaleable Dunn's apples with the exception of the top row, which contained a layer of fine bright clean apples of the same variety. The buyer bought them at a good price on the face value of the top row, after which the deception was discovered and complaint made to the Department. Such practices as this, and the packing of inferior varieties under false names, representing that they are better-quality varieties which sell well, should be discouraged in every way possible, for not only is the consumer detrimentally affected, but the matter has a correspondingly bad effect on the careful packer. Although these practices may not be common, they are far too frequently carried out by some growers, and have a decidedly detrimental effect on the industry generally.

—W. T. Goodwin, Assistant Director of the Horticulture Division.

AUCKLAND.

During the month of June there is usually ample opportunity for attending to general odd jobs about the orchard. Such work as the maintenance of shelter-belts, clearing of drains, overhauling of machinery, and repairs to sheds, glasshouses, &c., should be carried out during this month. The most important work, however, for those orchardists who are contemplating extension of acreage is the preparation of the new planting-sites, and when the weather affords favourable opportunity the final preparation of the ground for planting out new trees should be pushed on.

Growers of citrus fruits are advised to be watchful for the first appearance of the citrus bark-blotch disease, which, unfortunately, is becoming rather widespread in the Auckland District. The presence of the disease is invariably

indicated by the yellowing of the foliage. This does not, of course, mean that all trees upon which the foliage turns yellow at this season are attacked by bark-blotch, but where the disease is present that indication is always noticeable. Immediately infection is detected all diseased portions—discoloured bark and the woody portions of the tree immediately beneath—should be removed and the wound at once painted with corrosive sublimate, 1–1;000 (1 tabloid to 1,000 parts of water), and when this becomes dry repainted with coal-tar.

Intending citrus-growers who contemplate planting on heavy clay land are warned that such a situation invariably induces the attack of collar-rot or bark-blotch disease. —*J. W. Collard, Orchard Instructor, Auckland.*

HAWKE'S BAY.

The pruning of stone-fruit trees should now be pushed on. Whatever system is adopted it is important that the fruit-bearing wood should be properly spaced; this will allow the new wood to become better developed than would be the case if the laterals were left crowded, and permit a more even distribution of fruit, which will be much appreciated at thinning-time. Bearing trees which have not furnished well with young lateral growth should have all fruited laterals cut very lightly, but the greater portion of the old furnishing wood removed. The leaders should be cut back to one of the stronger laterals, which is left uncut, this often having the effect of promoting growth throughout the tree. When leaders are being pruned it is not desirable to head them back severely, but a vigorous lateral conveniently placed to retain the stature of the tree can usually be selected as the leader. In this manner the bush-headed condition so common in older trees can be done away with, while the framework of the tree is retained. In the pruning of peach and nectarine particularly it is wise to aim at a moderate supply of matured young wood well placed throughout the framework of the tree rather than to tip-extensions.

The pruning of pip-fruit trees may be taken in hand as the trees become dormant. The scope and execution of pruning is so large a subject that little more than passing reference can be made in the space allowed for these notes; however, on request, I shall be glad to visit any orchard and advise the best practical methods to adopt to suit the local conditions.

Where the land has been properly prepared, planting may be commenced during June. Under no circumstances should trees be planted when the soil is saturated. Should trees come to hand at such a time the bundles should be opened and the trees placed in a trench until the land is friable enough for working. —*W. H. Rice, Orchard Instructor, Hastings.*

NELSON.

Some of the worst disease-affected crops this season were due to the spray-pump getting out of order right in the middle of the season. The fruitgrower is unable to avoid the interruption to spraying operations that sometimes occurs frequently in spring on account of windy or wet weather, but when this is added to by spray-pump breakages the position soon becomes serious, and consequently the work actually done goes for little or nothing because of its incompleteness. The alternative is to have a thorough overhaul of the spraying outfit now during the interval between the seasons.

A great deal of time is lost in some of the larger orchards during summer through the necessity of going long distances for water for spraying. Some growers have reduced this loss to a minimum by damming creeks and digging wells. Others have water most conveniently placed on hill ridges and spurs by digging out a large circular tank in the clay and plastering the walls, this being filled by fencing off a small area in which rain-water runs into cut channels and so into the tank. The land now is in good condition for doing such work expeditiously.

Most growers prefer to delay the pruning until later in the season, but it is not too soon to make reference to some of the problems now. Rokewood apple-trees, for instance, are often shamefully overloaded year after year, though the regularity of this crop makes perfectly safe its thinning by the much cheaper and quite satisfactory method of spur-pruning at this season. Other trees, again, chiefly the more vigorous kinds and varieties such as pears, apricots, peaches, and the more strongly growing apples, are sometimes found very bare and unprofitable on the lower parts about the base, while the upper limbs are little better, owing

to the crowding of the branches and leaders. Young trees should not be allowed to get into this condition, and older trees of the type referred to should have the tops gradually thinned, so that the sunshine and light will once more cause the whole frame of the tree to be furnished with fruitful spurs and laterals. Another point to be remembered is the invigorating effect of cutting laterals back to a point just above a wood-bud. Some trees in most orchards might well be treated thus, including all the Jonathan trees. Conversely, the over-vigorous kinds should be treated the other way—laterals being removed altogether if crowded, or shortened to a flower-bud or left at full length.

Fruitgrowers in the Nelson Province requiring demonstrations or classes in orchard-pruning or apple-packing should apply to the Orchard Instructor for their district.

—W. C. Hyde, Orchard Instructor, Nelson.

CANTERBURY.

When the trees have lost their leaves and show signs of being dormant, pruning may be commenced. The habit, fruitfulness, general development of the tree, growth made during the past season, and condition of the soil in which the tree is growing must all be taken into account when applying the principles of pruning. The art can only be mastered by practice and observation. Beginners are strongly advised to get advice from the Orchard Instructor before commencing this work, and to attend any pruning demonstration which may be given in or near their locality.

Where fruit-trees are to be planted out this season the work may be done before the end of May. If this is not practicable planting should be delayed until the spring, when the ground has become reasonably dry, the trees being heeled-in in the meantime.

Ploughing, if not already commenced, should be put in hand at once so that it may be completed before the winter rains set in. Plough toward the trees, leaving an open furrow along the middle between the rows so that any water collecting will be as far away as possible from the base of the trees.

Unprofitable apple, pear, or other trees which it is intended to graft in the spring should be marked, so that time will not be spent in pruning them. The trees from which scions are to be taken should be carefully selected. When the scion wood is fully developed carefully collect and place it in sand in a comparatively dry, shady spot until required.

In marketing the late varieties of apples and pears the same careful attention is necessary as was given to the earlier varieties. Fruit in storage should be regularly examined, and placed on the market before it commences to deteriorate. Growers are strongly advised to repack all stored fruit before placing it on the market.

—W. K. Dallas, Orchard Instructor, Christchurch.

OTAGO.

Pruning will be the main work this month. It is impossible to lay down hard-and-fast rules, as so much depends on soil, locality, climatic conditions, &c., but the main factor to aim at is a regular crop year after year, and not a very heavy crop one season and a light one the following. It is a mistake to overload any fruit-tree, for once a tree becomes stunted it is almost impossible to get it to produce vigorous growth. In some varieties of apples, such as Sturmer, Cleopatra, and Scarlet Nonpareil, spur-pruning will be found beneficial—that is, the thinning-out of some of the spurs where they are becoming too thick. This will be found more satisfactory than waiting until the fruit has set and then thinning out the crop. This applies to stone-fruits as well as pip-fruits. When pruning lateral-bearing varieties of apples, leave the weak laterals unpruned. It will be found, in most instances, that the terminal bud is a fruit-bud; consequently in the following season a bunch of fruit will develop, which will pull the lateral down, arresting the flow of sap and thus causing fruit-buds to develop along the lateral. This will then need to be cut back to a fruit-bud in the following pruning season. The reason for cutting back to a fruit-bud, instead of a leaf-bud or wood-bud is that by cutting to the former further growth is checked, and consequently more fruit-buds are developed nearer the main branch or leader, which is the ultimate object aimed at by the scientific pruner.

In the storing of apples and pears it is well to remember, in localities where black-spot is prevalent, that the fruit must be perfectly dry when picked, as nothing is more favourable to the spread of this disease than moist conditions combined with a warm atmosphere. Also see that the fruit is stored in well-seasoned cases and stacked so that the air can circulate freely around the boxes. Of course, all affected apples and pears should be stored well away from clean fruit. Too much ventilation will probably cause some of the fruit to shrivel, but this is preferable to having it more or less affected by black-spot.

—B. G. Goodwin, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

MANAGEMENT OF THE BREEDING-BIRDS.

WHERE it is intended to put eggs in the incubator or under the natural mother in July, it is a mistake to leave the mating-up of the breeding-birds until just before the eggs are required for hatching. The safer and better plan is to make up the pens well in advance; the birds will then have good time to settle down, and there will be greater surety in obtaining fertile eggs. Very often when birds are first mated the male bird will exhaust himself at the outset, and it is often weeks before he settles down and satisfactory fertility is obtained. The best months for hatching out the heavier breeds such as Rocks, Orpingtons, and Wyandottes are July and August, while August and September is a good time for hatching White Leghorns and breeds of similar type.

The number of hens to be run with a male depends entirely on local conditions, the nature of the quarters also having an important influence on this matter. Cases of non-fertility have come under my notice where only half a dozen hens were in the pen—but the pen was a small one. When moved to quarters where a good free range was available the fertility was all that could be desired. Generally speaking, given fair conditions under confinement, the proportion should be six to eight hens of the heavier breeds and ten to twelve of the lighter breeds. On a free range, however, good fertility may result when up to twenty females or even more are run with one male.

Male birds which carry large combs and long wattles, which are common in such breeds as Leghorns, Minorcas, &c., should have these removed before being placed in the breeding-pens. As a result of this slight operation a bird will usually fertilize more eggs and produce much stronger germs. The operation can be simply performed by means of a pair of sharp scissors, a good dressing of iodoform being applied to the cut parts in order to prevent bleeding and other after-effects. Long spurs on the male bird are another common cause of infertility of the eggs, and often results in hens having their sides badly ripped. The points of the spurs should be removed with a fine saw to within, say, $\frac{1}{2}$ in. of the shank. If a little Stockholm tar is dabbed on the surface of the cut little or no bleeding will result.

It will be obvious, again, that more and better-fertilized eggs will be obtained if the breeding-pen is located in a dry situation.

If good hatches of strong, sturdy chicks are to be produced the correct feeding of the breeding-birds is an all-important essential. Personally, I like to see the breeding-birds kept in what might be termed lean condition not only during the time they are producing eggs for reproductive purposes, but even well before they are mated. It is safe to say that half the mortality that takes place among chickens during the brooder stage has been caused by nothing else but an over-fat condition of the breeding-hens. This does not imply that the birds should be placed on what might be termed a starvation ration, but rather that they should be well but not over fed. In other words, they should be fed according to their condition, care being taken that they are not allowed to put on a surplus of interior fat. Even when the birds are well fed the formation of surplus fat can be prevented to a great degree by compelling them to work for practically every grain of food they receive.

In the feeding and management of breeding-pens many lessons can be taken from birds that live under natural conditions and have no interference from man. It will be found that the great majority of these commence their breeding

operations after the most lean period of the year—the winter—when foodstuffs are most scarce. In addition to this, the work of making their nests must all tend towards preventing an accumulation of bodily fat. It is an old saying, and no doubt a true one, that Nature's methods cannot be improved upon, so that if vigorous progeny are to be secured from our fowls the natural ways must be copied as closely as possible in all things pertaining to breeding.

Of course, nature's ways cannot be closely followed in the feeding of fowls for the production of high egg-yields. These are virtually an artificial product, and obviously artificial methods must be adopted to secure them. While it is true that the high-typed layer cannot be overfed on a proper egg-producing food, it is possible to make a bird overfat when she is on a diet such as is desirable for breeding-birds, where there should be little or no forcing ingredient, such as meat or its substitutes, included in the ration. It will generally be found that better fertility and stronger chicks will be obtained by feeding the breeding-birds a whole grain ration, such as an equal admixture of wheat, oats, and maize, no mash whatever being supplied. This should be fed in deep litter as a means of compelling the birds to take a maximum of exercise, that great essential for the maintenance of a healthy condition.

Another necessary means of keeping the birds in good form is to keep them well supplied with green material, gravel, grit, crushed oyster-shell, and clean water. Where breeding-birds are made to scratch for the whole of their grain ration it is a common occurrence for the male to become run down and lose condition. For this reason he should be frequently handled, and if found to be losing weight he should be taken out of the pen at least once a day and given a good meal by himself. Another means by which a male may be maintained in good condition is to have a tin containing food nailed against the wall sufficiently high for the male to reach but not the hens. In this way the male can secure food at will whenever required. Of course, the tin should be sufficiently narrow to prevent the females from resting upon it and taking the food.

Correction: In last month's notes it was stated (page 247) that "the morning mash may consist of 2 parts good-quality wheatmeal to 1 of bran." This should have read, "1 part of wheatmeal to 2 of bran."

THE APIARY.

F. A. JACOBSEN, Apiary Instructor.

ACTIVE work in the apiary having ceased, beekeepers are inclined to take things easy, but apart from the annual vacation there are multifarious duties that require attention during the winter months. Not the least of these is the mapping-out of a plan of operations for the coming season. If increase is desired there will be hives and frames to make up; in any case a number of these should always be kept on hand as a precaution against swarming. Beekeeping is a business where system counts, and those who have not formulated a definite working-plan will find it to their advantage to give the matter some attention. Map out the work in detail—the number of queens required, the method to be employed if increase is desired, the system of swarm-prevention, and everything necessary to the well-being and profitable working of the apiary.

During the winter, additions to buildings and repairs to hives and supers should be effected. Painting and repairing covers to keep them watertight is a most important item. Anything that is necessary to preserve the life of the working plant should be done at this season, as during the summer months other and more important work will claim prior attention.

Every beekeeper should be an experimentalist in a small way, and thus gain knowledge relative to the various methods of manipulation that best suit the locality. Breed from queens showing purity of strain, prolificness, gentleness, and gathering-qualities. Queens of this kind should also be selected for producing drones, and drone-breeding in other hives curtailed to a minimum so as to increase the chance of a more suitable sire for future generations. Nature has taught us that the quality of the sire has a very great influence on the progeny, and the method described is the only one in apiculture whereby desirable characteristics on the male side can be secured. This matter deserves more attention than is bestowed upon it at the present time.

If not already done, old combs and wax-refuse should now be rendered into a marketable product, care being taken to get the wax thoroughly clean without injuring the texture.

The cost of hives in the first instance is considerable, so that every care should be taken of them. If kept well painted as a protection against the weather the average hive should last a lifetime. Bottom-boards should not be placed directly on the ground, but raised on four bricks or concrete stands. Another method is to form a stand, using totara piles (these will not rot quickly) to which are nailed scantlings measuring 2 in. by 3 in. by 8 ft., the whole being properly levelled. The height from the the ground should be about 9 in., and stands of this kind and size will hold three hives comfortably, the entrance to the middle one facing in the opposite direction to the other two. This is a convenient method on rough ground where a permanent location has been secured but where levelling would be difficult. It also has the advantage of protecting the entrances from obstruction by long grass, while hives so placed cannot be so easily overturned by stock. When levelling hives they should be given a slight cant to the front so as to prevent water running in at the entrances during wet weather, and also to shed water from flat roofs.

VITICULTURE.

J. C. WOODFIN, Vine and Wine Instructor.

VINEYARD AND CELLAR.

PRUNING can be commenced when the leaves have fallen and the young wood is ripe, though not earlier. Bioletti states that "vines pruned soon after the vintage, and while the vines were still covered with green leaves, started on an average ten days later than those pruned after the fall of the leaves." There are few green leaves remaining now, but still plenty that have not fallen. In the frosty areas the pruning should be deferred till the buds begin to swell.

Canes which have been selected for grafting—scions on the most fruitful vines, and only such vines should be reserved for this purpose—should not be cut until they are perfectly ripe. The best part of the cane commences at the fourth node from the base, and continues as far as the wood is thick enough for the purpose. A convenient length to cut the canes into is from 3 ft. to 3 ft. 6 in., leaving a few inches of wood above and below the nodes. They can then be stratified in clean dry sand, in a cool cellar or shed, protected from the sun and rain. The stocks for bench grafting can be treated in the same manner.

Racking should be continued in the cellar, care being taken to rack the wines into perfectly sweet wood, free from acetic or musty odours. It is very easy to spoil a promising young wine at this, the most critical period of its life; and diseased wine, with the best of treatment, can seldom, if ever, be brought back to the condition of a first-class wine.

In examining a cask to see if it is in a suitable condition to receive the wine, give it a few sharp raps with a stick or cane, then inhale the air from the bung-hole, drawing the air well back into the nasal cavity, making a mental note of the sensations received. If a vinegary, musty, or foreign odour is detected the vat should be scraped and brushed out with a hard dry brush, then washed out with a solution of soda and hot water (1 lb. to the gallon), and rinsed with clean cold water. In the case of a barrel, pour in the soda solution, bung with a chain bung, and roll for ten minutes, then rinse as above. Now prepare a 10-per-cent. solution of bisulphide of lime and water, and apply it to the vat or barrel, leaving the solution in contact with the wood for fifteen minutes, and rinse with clear water. Fill the vessel with water, and let it remain for a day or two in order to take up any bisulphide of soda remaining in the wood. This treatment will be found efficacious in eradicating slight acetic or mouldy taints.

Wines can be blended with advantage at this period. The clearing of the cloudiness due to the mixing of two or more wines containing different proportions of alcohol and other substances will be greatly assisted by cold weather. In order to take full advantage of the cold at this season the ventilators of the cellars should be kept open at night and closed during the day. The doors should also be kept closed where possible. Bottling should be proceeded with on bright cold days.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

EARLY cabbages should now be planted, and peas sown on a sunny plot that does not get too wet in winter. There may be a part of the garden where the soil becomes too dry for crops in summer. This is just the place for early peas. There are several places in the Dominion where the earliest peas are grown as the sole crop, the soil being too dry to grow anything properly in summer. Broad beans should be sown in June. It is not advisable to sow earlier, as it would only result in tall haulm with the lower part barren. Lettuces may be planted as soon as the plants are large enough to handle. In many parts of the Dominion lettuces are in use the whole year round. In such places the best plan is to sow more seed as soon as the plants from the last sowing are planted out. Spinach grown for home use should be thinned to leave the plants at least 8 in. apart. In this case the large leaves are pulled for use. Market-gardeners pull the whole plant and tie them in bundles, very little thinning being done. Carrots, parsnips, and Jerusalem artichokes are best left in the ground, digging as required for use. The tops of the artichokes should be cut off just above the ground. Burn the tops on the ground, and spread the ashes.

Celery: Where celery has been grown in trenches, and these were prepared in the ordinary way by digging a good layer of manure into the bottom of the trench, the deep working and manuring greatly improves the soil. Celery-growing in trenches involves a good deal of labour, but it is worth while if only for the improved condition in which the crop leaves the soil. When heads are dug the trimmings should be placed in the trench, and as each lot is dug the soil should be levelled down over the trimmings. These will soon rot down and still further enrich the soil. The site will grow excellent parsnips, carrots, or peas with no further manuring.

Seedling cabbages and cauliflowers: The cauliflower-plant is much less hardy than the cabbage-plant, and in many places the protection of a frame is necessary. The frames should be shallow or be nearly filled with soil. This is necessary to ensure the greatest possible amount of light for the plant, and to provide a free passage for air among them. Where sharp frosts occur the lights can be protected at night by sacking. The lights should be pushed off for a few hours on every fine day. If sufficient frames are available, the plants should be pricked off as soon as they can be handled. If there is no room for pricking-off the plants should be thinned to prevent undue crowding. If there are signs of blackleg or of damping-off, strew among the plants a small quantity of a mixture of air-slaked lime and sulphur. Where the plants are grown in the open air pricking-off is not so necessary with later crops or with the giant varieties. It is very important with early varieties, which are prone to premature bolting. Growers of large breadths of early cabbages are not likely to trouble to prick out the small seedlings, nor is it particularly important to do so. The right thing to do is to make more than one planting, taking the largest plants each time. This will prevent the stronger from smothering the weaker plants, and these, being given more light, will strengthen up. In small cultivations the young seedlings should be pricked off. Better heads result from this practice.

Onion-growing.

Inquiries that have been received indicate that onion-growing is being taken up by a number of people who have had no previous experience in this branch of horticulture. It may be well to point out that onions cannot be successfully grown on every class of soil. A fair depth of friable soil is necessary, and good drainage. Unless drainage is good the soil is likely to be waterlogged during winter, and where this is the case it may not be possible to sow until late in spring, which is in most places a disadvantage. More or less dry summers are the usual experience, and unless a fair amount of growth is secured before dry weather sets in it is not likely that a good crop will be obtained. The best weather conditions for onion-growing are a fair amount of rain in spring and early summer, occasional rains during the summer months, and a dry time for the ripening process. The autumn months are usually accompanied by rain,

and less sunshine because the days are drawing in. The earlier growth is finished the better the prospect for well-ripened bulbs. An early start is necessary to secure both good growth and early ripening. It is, however, only courting failure to sow before the soil is fairly warm, which may be early in July or not until a month or six weeks later, the time varying in different localities. Weeds are an important consideration; land infested with couch, twitch, or sorrel should not be used. Even annual weeds, if present in great numbers, may render the enterprise unprofitable. It is a very great mistake to leave the ploughing and preparation of the soil till just before sowing or planting. The soil should be in course of preparation some months before. Plough deeply, work the soil down, and have the surface frequently stirred, then most of the weed-seeds will germinate and can be destroyed. If a spring ploughing is necessary it should be as shallow as possible. Where old pasture is broken up there is usually less trouble with weeds than is the case with cultivated land. In this case early ploughing allows time for the turf to decay and the soil to settle down. A firm seed-bed is necessary. This can be generally secured by the course of preparation indicated, though in some cases pressure by a roller or a heavy slab of wood is necessary before sowing.

Potatoes.

Potatoes require a different bed to onions. Firming the soil is not necessary or desirable. Where the plot is large enough for the plough the first ploughing should be shallow and the spring ploughing deep. In the case of pasture-land, harrow down soon after skim-ploughing and the sod will rot down. About a month before planting-time cross-plough as deeply as possible. Leave the furrows till just before planting, then break them down with a grubber. Where the land has been under other crops, early skim-ploughing allows time for weed-seeds to germinate, and to work out weeds with perennial roots. In both cases the final preparation should be the same.

Ruakura Sale of Pedigree Stock.—The third annual sale, held at the Ruakura Farm of Instruction on 27th April, was largely attended, and, considering the existing conditions, a good demand was experienced. The young Milking Shorthorn bulls sold averaged nearly twenty-nine guineas, the highest realization being fifty-seven guineas for Dominion Dignitary of Ruakura. Jersey bulls averaged twenty-five and three-quarter guineas, with thirty-one guineas, paid for Dominion Cherry-branch, as the highest price. Berkshire boars ranged from two guineas to eleven guineas (Dominion Canada), and Berkshire sows from three guineas to thirteen guineas (Dominion Gentle and Dominion Lilac), both boars and sows averaging five and three-quarter guineas.

Exhibition of Java Products.—The Minister of Agriculture has been advised by the Netherlands East Indies Department of Agriculture, Industries, and Commerce that an exhibition of the products and manufactures of Java is to be sent to New Zealand. The exhibition will visit Australia, and will afterwards come to Auckland, Wellington, Christchurch, and Dunedin. Mr. Teppema, Acting-Consul-General for the Netherlands in Australia and New Zealand, will be in charge of the exhibition, and he proposes to deliver illustrated lectures in the centres.

Egg-laying Records.—In connection with the seventeenth egg-laying competition of the New Zealand Utility Poultry Club, which closed at Christchurch last month, it was recorded that in the single-pen section a White Leghorn laid 330 eggs for fifty-one weeks, although she did not come into profit until ten days after the commencement of the competition. Her performance since 13th October, laying an egg daily for 175 consecutive days, is said never to have been equalled in any competition. In laying 815 eggs in fifty-one weeks a pen of White Leghorns created a new record for three birds. In the duck section heavy scoring was done by two single-penned ducks, which laid 329 and 319 eggs respectively.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith Letters should be addressed to the Editor.

GROWING ARTICHOKES FOR PIGS.

"FAR NORTH," Awanui :—

In the February *Journal* it is stated that in feeding off artichokes with pigs the animals should be taken off before all the tubers are eaten if it is desired to keep the paddock down in this crop. Would it then be necessary to plough and harrow the ground, or would the rooting of the pigs afford sufficient cultivation? Could this method of seeding—leaving some of the tubers in the ground—be continued year after year, or would it be necessary to plant out strong sets every third or fourth year?

The Agricultural Instruction Branch :—

Artichokes respond well to cultivation, and the amount necessary in an established field depends largely on the type of soil. On a good free-working loam, surface cultivation to level the ground after the pigs are removed from the field, and harrowing in the spring to keep the surface broken till the plants are 4 in. high, is all that is necessary. On heavier classes of soil, if the land has set at all during the winter with the tramping of pigs a spring ploughing is beneficial. By removing the pigs, before all the tubers are eaten out the field can be kept continuously in the crop and replanting is not necessary.

UNTHRIFTY LAMBS.

"FARMER," Waipu :—

Some of my lambs which have been feeding on rape for the past ten weeks have not done well, and have not fattened as expected. Lately I have noticed a number with soft swellings under the jaw. Some of the latter have died, and when dead seem to have a white frothy discharge from the nose. Kindly advise the cause and treatment of this complaint.

The Live-stock Division :—

In seasons like the present, in which there have been copious rains and an abundance of feed of a watery nature, lambs do not thrive as well as in dry seasons. Further, your lambs are evidently suffering from parasites of the lungs (lungworm). Generally, this is associated with parasites of the stomach. Under the circumstances, we would advise you to dose the animals with lysol. A small teaspoonful should be given in a half-pint to a pint of milk. In addition to this the lambs require to be dry-fed. A daily ration of chaff, bran, and crushed oats would be beneficial.

OLIVE-GROWING IN NEW ZEALAND.

"OLIVIA," Gisborne :—

I should be glad if you could inform me if olives can be grown in New Zealand, and, if so, what method of culture should be used, where seed or young trees may be obtained, and what pests they are subject to.

The Horticulture Division :—

Olive-trees can be grown in parts of New Zealand where hard frosts are not experienced. They will bear some frost, as is proved by the existence of a fairly old grove in the neighbourhood of Palmerston North. This grove fruits freely, but the fruit is small. There is also a very old grove at Auckland planted by the late Sir J. Logan Campbell. It is not yet known whether the olive can

be profitably grown in this country as a commercial undertaking. There is a number of varieties, some very superior to others in size of fruit. No special cultivation is required. The conditions considered best are a calcareous soil on hillsides, and a low rainfall. The olive appears to do best under conditions that would be too hard for fruit-trees in general. The trees are liable to attack by scale insects. It is doubtful if you could obtain seeds in New Zealand; in any case the trees are hard to raise without special treatment. Some of the large nurseries stock olives.

FEEDING WHEAT TO PIGS.

T. S. WARD, Raetihi :—

Will you kindly inform me if, in feeding wheat to fattening pigs, the grain is best steamed, boiled, or fed in the raw state; also state how much per pig per day is required ?

The Instructor in Swine Husbandry :—

There is very little advantage to be gained by steaming or boiling any grains for pigs; soaking the grain for twenty-four hours before using is to be preferred. It has been found that grinding wheat to a meal saves about 16 per cent., and crushing or rolling 22 per cent., over the whole grain. Comparing soaked ground wheat with soaked whole wheat there is 13 to 25 per cent. advantage in food value in favour of the former. As wheatmeal has a tendency to form a sticky mass in the pig's mouth, it is advisable to feed it in the form of a thin slop. The amount required per day per pig varies according to the age and size of the animal, and is calculated at the rate of from 1 lb. to 3 lb. for every 100 lb. of its weight. This amount applies to any grains. Wheat, having a high commercial value for milling and poultry-feeding, is not in general use for pig-feeding, unless in a damaged state and not fit for the other purposes. A more suitable feed can be obtained by using barley, maize, and peas, which can be fed whole, dry, or soaked without grinding, thus saving the extra expense.

COCKSFOOT AND CHEWINGS FESCUE FOR SEED.

I. PENROSE, Wendon Valley, Southland :—

I have about 8 acres of river-flat which I wish to sow down in cocksfoot for seed. I should be glad to know the rate of seeding required, and if cocksfoot does better with a mat-forming grass and clover. Is it correct that cocksfoot does not do well in conjunction with Italian rye-grass ? I also desire to sow 50 acres of poor ridge land in Chewings fescue for seed. What quantity of seed should be used, and, if sown in spring, could it be harvested the following autumn ?

The Agricultural Instruction Branch :—

Cocksfoot does quite well in conjunction with other grasses and clovers, but for seed-production sowing pure at the rate of 18 lb. per acre is recommended. The impression that cocksfoot does not grow well in conjunction with Italian rye-grass has probably been due to the too sparing seeding of the former, resulting in its appearance in isolated clumps. Chewings fescue for seed purposes should be sown at the rate of 15 lb. per acre. If sown in the spring it can be harvested the following autumn.

BASIC SUPER AND BLOOD-AND-BONE.

"INQUIRER," Manurewa :—

Kindly inform me what effect basic superphosphate would have on blood-and-bone manure if the two were mixed together. Would the lime in the basic super cause the nitrogen of the blood-and-bone to be driven off ?

The Agricultural Instruction Branch :—

If it is true basic super—only sufficient lime (on the average about 15 per cent.) having been used to neutralize the acidity of the original superphosphate—the mixing of this with blood-and-bone will not cause the nitrogen of the blood-and-bone to be driven off.

THE WOOL MARKET.

REPORT BY THE NEW ZEALAND WOOL COMMITTEE.

THE New Zealand Wool Committee (Mr. T. R. Lees, Chairman) has presented to the Minister of Agriculture the following report on its work from 1st October, 1921, to 31st March, 1922, covering the past wool season :—

1. The Committee has to record a gradual rise in prices for all classes of wool during the six months, together with a very satisfactory clearance of stocks in New Zealand. The prices for medium and low crossbred wools are still below the cost of production, but the keen demand for all classes of wool and the rapidity with which same have gone into consumption during the period under review justifies the strong belief that producers can safely look forward to a return to payable prices in the very near future.

2. The system of registration under which wool-brokers, banks, and wool-exporters gave written undertakings, enforcible by bond if required, not to dispose of wool at prices below the minimum prices fixed by the Committee has been continued throughout this season; but from December onward the prices at which wool was saleable have been substantially higher than the very low fixed prices, and it will be unnecessary to continue the system next season.

3. The Committee has continued to allocate, in consultation with the New Zealand Wool-brokers' Association, the quantity of wool which may be offered for sale at each centre, and later, after consultation with the provincial wool-brokers' associations, allots the quantity of wool which may be offered by each individual broker at such sale. The Committee is of opinion that it is very advisable to retain these powers so as to prevent excessive offerings at any moment or point, with the attendant disadvantageous results. It is satisfactory to find that the Committee's actions and policy have been approved by the New Zealand Wool-brokers' Association, and that the Committee has been asked by resolution of that body at its annual meeting to continue in office and carry on this work.

4. During the latter part of 1921 an unfortunate disagreement arose between the overseas wool-buyers and the banks in regard to the form of bill of lading which would be acceptable to the latter for operations under buyers' letters of credit. The English banks insisted on a reversal of the practice which had been in existence for many years by which buyers were able to obtain bills of lading immediately the wool had been delivered to the care of the shipping companies, and demanded that bills of lading should not be issued until the wool was on board the carrying steamer. The wool-buyers in turn declined to operate at the sales unless the "prompt" day (*i.e.*, date of payment) was extended to such future date as they were able to obtain such bills of lading as the banks required. This dispute caused the cancellation of all wool-sales during the month of November, 1921, but towards the end of the month, at a conference between the wool-buyers, banks, and wool-brokers, presided over by the Right Hon. the Prime Minister, an agreement was arrived at to cover the remainder of the season by which the brokers agreed to extend the "prompt" to the date on which the carrying steamer entered port, but not to exceed twenty-eight days from the date of sale, the buyers undertaking to use their best endeavours to make such permanent arrangement with the banks as would enable the usual fourteen days "prompt" to be reverted to for next season. This arrangement enabled the sales to proceed, but has not been satisfactory, and in practice has resulted, in the great majority of cases, in producers not being paid for the wool purchased until the twenty-eighth day after sale.

The Wool Committee is strongly of opinion that producers should not be compelled to give the extended credit enforced upon them during the past season; that arrangements with banks for the payment of wool purchased is purely the buyers' concern; and that during next season the strict terms of fourteen days "prompt" should be reverted to.

5. The following are the sales which have been held since 1st October, and the results :—

Date of Sale.	Centre.	Offered.	Sold.	Average Price per Bale.	Average Price per Pound.
1921.		Bales.	Bales.	£ s. d.	d.
October 14	Wellington ..	7,167	6,969	7 2 5	5·55
,, 18	Auckland ..	5,085	4,558	6 17 6	4·45
,, 20	Wanganui ..	4,032	3,611	6 10 3	4·21
December 5	Auckland ..	8,749	6,783	6 8 8	4·35
,, 9	Wellington ..	15,491	13,433	8 3 7	4·95
,, 13	Napier ..	15,966	14,097	6 15 4	4·47
,, 16	Christchurch ..	20,352	18,227	9 14 11	6·92
,, 21	Dunedin ..	10,904	10,302	9 17 5	6·90
1922.					
January 3	Timaru ..	9,903	9,569	9 13 4	6·85
,, 6	Wanganui ..	13,347	11,991	7 15 11	4·85
,, 11	Napier ..	19,992	18,007	8 2 3	5·16
,, 16	Wellington ..	19,986	18,168	9 3 5	5·65
,, 20	Christchurch ..	20,465	19,796	12 4 7	9·01
,, 25	Invercargill ..	14,108	12,499	8 9 6	6·13
,, 30	Dunedin ..	18,426	17,648	12 13 8	8·90
February 3	Timaru ..	12,000	11,216	11 7 8	8·92
,, 8	Auckland ..	10,052	9,623	8 6 5	5·60
,, 13	Napier ..	16,095	15,186	8 3 8	5·20
,, 17	Wellington ..	24,828	21,505	8 14 11	5·30
,, 23	Christchurch ..	18,012	15,422	11 3 10	7·69
,, 28	Dunedin ..	20,108	17,463	11 2 7	7·77
March 3	Invercargill ..	9,865	8,864	8 2 3	6·04
,, 10	Wellington ..	18,837	16,714	8 0 0	5·40
,, 14	Napier ..	11,704	10,418	7 11 8	4·70
,, 17	Wanganui ..	19,245	17,037	8 2 11	5·02
,, 21	Auckland ..	12,223	9,690	7 10 3	5·10
,, 27	Christchurch ..	9,934	9,099	10 4 4	6·96
,, 31	Dunedin ..	11,290	10,878	11 1 9	7·70
Various dates	Gisborne ..	2,753	2,753		
Total ..	..	..	361,526		

It will be noted that where the finer qualities of wool are offered at certain points in the South Island higher average values are recorded, and the converse applies to certain points in the North Island where coarser types of wool predominate.

A sale was subsequently held at Wellington on 5th April, at which 14,403 bales were offered and 13,901 bales sold, at an average price per bale of £8 14s. 4d. and per pound 5·37d.

Further sales have been allotted to complete the season as follows: May 3, Timaru, 5,500 bales; May 5, Dunedin, 2,000 bales; May 11, Christchurch, 2,000 bales; May 16, Auckland, 3,000 bales; May 18, Wanganui, 7,500 bales; May 22, Napier, 5,000 bales; May 25, Wellington, 7,000 bales.

6. The sales of New Zealand free wools from 1st July, 1921, to 31st March, 1922, have been as follows: Sold by auction in London, 201,214 bales; New Zealand, 413,954 bales: total, 615,168 bales.

By the end of May the Committee estimates that not more than 45,000 bales of wool of the 1920–21 and 1921–22 clips will remain unsold in New Zealand.

Although a great part of this wool has been sold at prices unremunerative to growers, there has been very little speculative purchasing, and the great bulk has been sold for direct consumption in the mills of the United Kingdom and the Continent. On the whole the purchases for shipment to the United States of America have been small.

7. Liquidation of the Imperial carry-over stocks has proceeded steadily during the year, the position at 31st March, 1922, being as follows :—

	Australian. Bales.	New Zealand. Bales.	Total. Bales.
Stocks, July 1, 1921	1,554,844	739,753	2,294,597
Sales by auction, United Kingdom and Continent, 1/7/21 to 31/3/22	573,844	185,753	759,597
Stocks, March 31, 1922 (approximately) ..	981,000	554,000	1,535,000

These stocks are approximately made up as follows :—

	Australian. Bales.	New Zealand. Bales.
Merino	522,000	3,000
Fine crossbred	293,000	16,000
Medium crossbred	114,000	132,000
Low crossbred	52,000	177,000
Slipe	..	113,000
Scoured	..	113,000
	981,000	554,000

The stocks of Imperial wool in New Zealand included in the above, which amounted to 314,904 bales at 1st July, 1921, had been reduced to 178,723 bales at 31st March, 1922, and under the present shipping programme will all be cleared from New Zealand by the end of September, 1922.

8. Australian wool of the 1920–21 and 1921–22 clips has sold freely during the past nine months, the latest figures being as follows :—

	Bales.
Sold by auction in London from 1/7/21 to 31/3/22	216,328
Sold by auction in Australia from 1/7/21 to 31/3/22	1,112,521
Total	1,328,849

9. The disposals of Australian and New Zealand wool combined for the nine months from 1st July, 1921, to 31st March, 1922, have been as follows :—

	Australian. Bales.	New Zealand. Bales.	Total. Bales.
B.A.W.R.A.	573,844	185,753	759,597
Free	1,328,849	615,168	1,944,017
Total for nine months ..	1,902,693	800,921	2,703,614

The actual production of Australian and New Zealand wool, including slipes, for the twelve months ending 30th June, 1922, is estimated as follows :—

	Bales.
Australia	1,850,000
New Zealand	575,000
Total	2,425,000

So that the actual sales of Australian and New Zealand wool during the nine months have been approximately 278,000 bales more than a full year's production; or, put in another way, the sales have been nearly 50 per cent. greater than the production during the nine-months period.

10. The latest report received by the Committee states that the surplus stocks of wool in South America have been almost totally bought up, and Argentine and Uruguay are even barer of wool than New Zealand.

The report adds that the fact that during the last six months the sales of New Zealand, Argentine, and Uruguay wools have equalled a full year's clip is a clear indication that manufacturers are beginning to realize that the annual production of crossbred wools is now substantially below actual requirements, and that as B.A.W.R.A. stocks disappear a period of definite scarcity approaches.

After careful study of all the information at its disposal the Committee holds a strong opinion that a continued rise in prices of New Zealand wools is to be anticipated, and that the dark cloud which has been overhanging the growers of crossbred wool, particularly for the last eighteen months, will be soon removed.

11. The Committee attaches hereto a table, for which it is indebted to the assistance of the British-Australian Wool Realization Association, which indicates by countries the average annual pre-war wool-production of the world based on the years 1908 to 1913, and also the production for the years 1920 and 1921. Together with official Government estimates and the reports of American consular and commercial officers abroad, valuable tables of the National Association of Wool-manufacturers and the U.S. Department of Agriculture (Bureau of Markets and Crop Estimates) have been utilized. Official statistical records of some regions are often much delayed, and in some cases not obtainable; and in instances where 1921 census reports have not been available an earlier figure or an unofficial estimate has been inserted.

WORLD PRODUCTION OF WOOL (COMPUTED ON GREASY BASIS).

Countries.	Average Annual Pre-war Production, 1909 to 1913.	Production in 1920.	Production in 1921.
North America.	lb.	lb.	lb.
United States	314,110,000	302,207,000	224,564,000
British North America	11,210,000	24,422,531	24,050,000
Mexico	7,000,000	750,000	500,000
Total	332,320,000	327,379,531	249,114,000
Central America and West Indies	1,000,000	750,000	750,000
South America.			
Argentine	358,688,000	308,560,000	286,000,000
Brazil	35,000,000	27,000,000	27,000,000
Chile	17,430,000	33,069,000	33,069,000
Peru	9,940,000	9,420,000	12,000,000
Falkland Islands	4,324,000	3,200,000	3,200,000
Uruguay	156,968,000	100,000,000	95,000,000
All other	5,000,000	5,000,000	5,000,000
Total	587,350,000	486,249,000	461,269,000
Europe.			
Austria	15,360,000	..	..
Belgium	1,060,000	825,000	1,205,000
Bulgaria	23,700,000	17,802,365	17,636,800
Czecho-Slovakia	..	5,952,420	5,952,420
Denmark	3,508,000	3,508,000	3,508,000
Finland	..	3,250,900	3,250,000
France	80,688,000	39,400,000	39,400,000
Germany	25,600,000	37,278,242	42,975,000
Greece	14,000,000	16,000,000	16,000,000
Hungary	26,240,000	25,516,000	25,516,000
Iceland	1,980,000	1,980,000	1,980,000
Italy	35,000,000	50,000,000	50,000,000
Netherlands	3,556,000	5,500,000	5,500,000
Norway	8,160,000	7,247,000	7,247,000
Poland	..	6,724,030	6,724,030
Portugal	10,000,000	6,232,000	6,232,000
Roumania	13,228,000	13,228,000	14,000,000
Russia	320,000,000	150,000,000	150,000,000
Spain	52,000,000	142,000,000	165,347,000
Sweden	6,060,000	5,354,000	5,354,000
Switzerland	1,049,000	1,049,000	800,000
Turkey	28,000,000	..	..
United Kingdom	150,000,000	100,000,000	101,100,000
Jugo-slavia	25,446,000	48,859,000	23,800,000
Total Europe	844,635,000	687,705,057	693,527,250

WORLD PRODUCTION OF WOOL (COMPUTED ON GREASY BASIS)—*continued.*

Countries.	Average Annual Pre-war Production, 1909 to 1913.	Production in 1920.	Production in 1921.
	lb.	lb.	lb.
Asia.			
British India	60,000,000	60,000,000	60,000,000
China	50,000,000	50,000,000	50,000,000
Persia	12,146,000	12,146,000	12,146,000
Russia in Asia	60,000,000	45,000,000	45,000,000
Turkey in Asia	90,000,000	60,000,000	60,000,000
All other	1,000,000	1,000,000	1,000,000
Total	273,146,000	228,146,000	228,146,000
Africa.			
Algeria	35,221,000	33,184,000	33,184,000
British South Africa	157,761,470	127,176,800	127,176,800
Tunis	3,735,000	3,735,000	3,735,000
All other	13,000,000	13,000,000	13,000,000
Total	209,717,470	177,095,800	177,095,800
Oceania.			
Australia and Tasmania	705,146,000	536,541,757	631,290,000
New Zealand	198,474,000	181,480,000	167,153,000
Australasia	903,620,000	718,021,757	798,443,000
All other	100,000	100,000	100,000
Total	903,720,000	718,121,757	798,543,000
Grand total	3,151,888,470	2,625,447,145	2,608,445,050

The greatest decreases from pre-war wool crops are to be found in regions raising principally low-grade wools, such as Russia and Turkey. It should therefore be borne in mind that the actual decrease in clothing-wools is not as great as the total would seem to indicate.

The following subsidiary table shows fairly the decrease in wool-production in those countries with which New Zealand wool has to compete :—

Countries.	Average Annual Pre-war Production, 1909 to 1913.	Production in 1920.	Production in 1921.
	lb.	lb.	lb.
North America	332,320,000	327,379,531	249,114,000
South America	587,350,000	485,249,000	461,269,000
British South Africa	157,761,470	127,176,800	127,176,800
Australasia	903,620,000	718,021,757	798,443,000
Europe.			
Belgium	1,060,000	825,000	1,205,000
France	80,688,000	39,400,000	39,400,000
Germany	25,600,000	37,278,242	42,975,000
Italy	35,000,000	50,000,000	50,000,000
United Kingdom	150,000,000	100,000,000	101,100,000
	2,273,399,470	1,885,330,330	1,870,682,800
Expressed in terms of bales of 400 lb. each	5,683,498	4,713,326	4,676,707

PIGS IN NEW ZEALAND: January, 1921.

Breed.	Boars of all Ages for Stud.	Sows of all Ages used or intended for Breeding.	Other Pigs.	Totals.
Purebred—				
Berkshire	4,952	17,634	62,249	84,835
Yorkshire	553	2,096	4,136	6,785
Other breeds	294	1,373	4,682	6,349
Total purebreds ..	5,799	21,103	71,067	97,969
Crossbred	3,576	29,126	219,221	251,923
Total pigs	9,375	50,229	290,288	349,892

IMPORTATION OF FERTILIZERS: MARCH QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the quarter ended 31st March, 1922, the name, quantity, and declared value of each kind, together with country of departure, being specified :—

Gypsum.—United Kingdom, 1 ton, £7.

Nitrate of Soda.—Australia, 15 tons, £340; Chile, 80 tons, £1,086: total, 95 tons, £1,426.

Basic Slag.—United Kingdom, 260 tons, £1,296; Belgium, 408 tons, £2,151: total, 668 tons, £3,447.

Bonedust.—Australia, 175 tons, £1,961.

Char-dust and Bone-char.—Australia, 22 tons, £157.

Guano.—New Caledonia, 1,637 tons, £3,376.

Rock Phosphate.—Nauru, 12,598 tons, £27,716.

Superphosphate.—Australia, 100 tons, £583.

Kainit.—United Kingdom, £6; Belgium, 15 tons, £56; France, 568 tons, £1,570; Germany, 401 tons, £1,570: total, 984 tons, £3,202.

Muriate of Potash.—Germany, 15 tons, £211.

Sulphate of Potash.—United Kingdom, 20 tons, £150; Belgium, 5 tons, £76; Germany, 250 tons, £2,747: total, 275 tons, £2,973.

Potash, other.—Germany, 20 tons, £112.

Other Fertilizers.—United Kingdom, £7.

NOTE.—With regard to the "declared values" which are given above, the Comptroller of Customs gives the following explanation: "The value for duty is defined as the fair market value in the country whence the goods are imported plus 10 per cent. As the addition of 10 per cent. does not cover the present freight, insurance, and other charges, the statistical value is less than the actual landed value."

FORTHCOMING WINTER SHOWS.

Otago A. and P. Society: Dunedin, 30th May to 3rd June.
Waikato Winter Show Association: Hamilton, 30th May to 3rd June.
Manawatu and West Coast A. and P. Association: Palmerston North (National Dairy Show), 20th to 23rd June.
Auckland A. and P. Association: Auckland, 3rd to 8th July.

(Agricultural and Pastoral Association secretaries are invited to supply dates and location of their shows.)

Rabies in Dogs.—Cabling to the Government on 11th May, the High Commissioner (London) advised an outbreak of rabies in Hampshire.